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The application of an information design approach to the development of a user-oriented digital local food map for Berkshire, Oxfordshire, and Hampshire

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Department of Typography & Graphic Communication

Esra Bulut Peynirci

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Declaration

I confirm that this is my own work and the use of all material from other sources has been properly and fully acknowledged.
The thesis has been proofread by a professional proofreader and its content have not been modified.

Esra Bulut Peynirci

Abstract

Local food is a crucial issue in the UK, corresponding to various aspects of social life. However, there is a need to integrate it into the digital world in a way that can respond to people's social habits and requirements. The aim of this thesis is to explore how a user-oriented way of sourcing locally produced food can be designed for a digital map that provides a satisfactory user experience. For this aim, an information design approach is adopted, and multiple user research methods are suggested to help design a local food map that effectively presents information to Berkshire, Hampshire, and Oxfordshire locals. The thesis draws on literature in the field of local food as well as scrutinising government documents regarding the geographical research area and prospective local food map users. Observations and surveys with vendors and consumers were conducted at farmers' markets to create personas and user scenarios. A visualisation workshop with information designers was organised to respond to users' needs, and usability testing conducted to evaluate the effectiveness of the design. The research findings confirm that incorporating user research throughout the digital map design cycle ensures consideration of users' social life experiences and needs, promoting focus on user experience. The main implication of the visualisation workshop to cartographic studies is that it provides ideas on how to design user-friendly and effective maps and develops an approach to defining a wide variety of symbols that meet users' needs and that is grounded in information design principles. The usability testing results also have implications for improving the usability of digital maps by providing user feedback to enhance user experience. Accordingly, this thesis provides insight into a user-oriented map design process for information designers and cartographers to work across the two disciplines to create effective digital maps.

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1 Introduction

1.1 Research topic, focus, and context

The relationship between people and how they source locally produced food is worth exploring as a potential factor influencing eating habits and healthy lifestyles. 'The term "local food" signifies freshness, healthfulness, hygiene standards, animal welfare, carbon footprint, trust, reduced fuel emissions, well-being, as well as the sustainability of local businesses' (Kemp et al., 2010). The technology that has developed in recent years still does not offer a clear picture of how these concerns and the needs of people buying and selling local food, which shapes our social lives, will be incorporated into digital life. One of the greatest challenges is how online systems can be designed to meet both the needs of consumers – who determine the quality of a product by seeing it or asking the seller in person – and sellers, who have different sales strategies in social situations. This thesis investigates how an efficient way of obtaining locally produced food can be designed for a digital map in a user-oriented way, by keeping users' needs in mind. In this regard, farmers' markets in the UK are one of the most attractive go-to destinations for buying/selling fresh and locally produced food for those who want to stay in touch with their community and those who want to support local businesses.

User-centred design studies in cartography in recent years indicate a paradigm shift in the approach to knowledge generation in terms of understanding maps and visualisations (Roth, 2019). Visualisation research in cartography has often used design approaches, especially geo-visualisation usability, and many practice-based studies in cartography have been carried out on exemplary usability studies. In this regard, scholars in cartography have addressed information design issues that can respond to the users' needs and promote the usability of maps, including the three 'Us': user, utility and usability (Roth et al., 2015). However, there are still gaps in adapting user-oriented approaches to cartography in order to make digital maps more

user-friendly. In this regard, it is necessary to include potential stakeholders in the development process in order to achieve the best possible user experience (Alamäki, 2015) and transfer users' needs to the map environment in the context of communication and representation.

This thesis, therefore, focuses on optimising the quality of user interaction according to user needs with digital maps, and considers the functional and aesthetic principles in the visualisation process. In doing so, this thesis investigates a prospective local food map design and focuses on the idea of a functional, intuitive and satisfying map. It explores the potential of information design and cartography to work collaboratively to make digital maps more user-friendly and focuses on enhancing the efficacy of digital map design by considering user needs and feedback during the design cycle.

1.2 Aims and research questions

This thesis aims to investigate a prospective local food map interface design that would effectively present information to Berkshire, Hampshire and Oxfordshire locals. The main focus is to help users easily find what they are looking for on the map and provide insight into finding local food. This research uses methods and insights applied in user-centred design (UCD) to identify how digital mapping can facilitate the distribution of and access to local food by optimising the effectiveness of the design of local food maps. In this regard, user research is conducted based on the needs of local food map users, surveying locals in the three counties. In parallel, this study develops personas and user scenarios, organises a visualisation workshop and develops usability testing to ensure that map interface elements —symbols, graphical variables and labels— are designed to meet the needs of the people using them. In doing so, this research focuses on improving the overall user experience (UX) in design practice; it thoroughly investigates what users need and feedback during the design cycle. In this research, three key research questions are addressed to investigate the usability of a prospective local food map:

Who buys and sells food at farmers' markets? This thesis begins by examining government documents regarding rural–urban areas in the UK to understand the demographic data relating to local food users and to choose a research area. Then, farmers' markets (FMs) in the research area – Berkshire, Hampshire and Oxfordshire – are used to understand locals' motivations for participating in FMs and to determine their interest in locally produced food. This research question is first answered through informal observations of the natural environment of FMs and second by surveying consumers and vendors regarding buying and selling food at FMs in Berkshire, Hampshire and Oxfordshire. Additionally, both groups' online selling and buying habits concerning local foods are investigated. Therefore, research findings at this stage identify features of local food maps that will increase the interest from people buying and selling locally produced food in using those maps.

What needs would influence the interface design of digital local food maps? Map interfaces create a communication channel between map designers and map users. The designer's role in effective communication is to understand the user's needs correctly in design research and provide the appropriate visual solutions to meet these needs when designing the interface. In this way, user interfaces (UIs) that take user experience into account anticipate what users might need to do and make sure that the elements of the interface are readily accessible, understandable and easy to use in order to facilitate those actions (Interaction Design Foundation, 2016b). This research question is answered first through user research with informal observation and a survey at FMs. These reveal that the needs of consumers and vendors can differ. While consumers visit FMs for higher-quality products, remaining local and a promoting healthy lifestyle, staying local and earning money are the main reasons sellers engage in FMs. There are also differences in the online habits of both groups in purchasing and selling local food. Issues such as delivery cost and packaging can affect vendors' online sales. Such findings from observations and surveys revealed at this stage are the basis for determining personas and user scenarios

throughout the subsequent stage of the design process. Thus, this thesis brings familiarity and empathy to the interface design by thoroughly understanding local food map user needs in the early stages of the design process, and thus enhancing user experience by making it easy for users to achieve their goals and perform tasks efficiently.

How can digital food maps be designed to reflect the needs of local food map users? A good user experience allows users to interact with a product easily. Providing a good user experience requires not only a beautiful and intuitive design but must also meet users' needs and expectations (Kasturika, 2023). In order to meet user expectations, information designers initially identify the problem, determine who is intended to receive the message, analyse the sender's goals, determine the intended message's purpose and objective and select the appropriate medium for transmission (Pettersson, 2014). In this thesis, the target user group (consumers and vendors at FMs) is included in the study from the early stages of the design process through the research on a prospective local food map. In this context, the existing demographic data about the target user group are examined, the user research is expanded within the methods applied by information designers, and the needs for a local food map are determined. Following the user research steps, the design practice allows the interface elements of local food maps —symbols, variables and labels— to be adapted to meet the users' needs. Design criteria regarding aesthetic and functional considerations are applied to improve the interface design. The local food map interface elements that emerged in the previous stage are presented to real users, and the design cycle is completed by evaluating their insights on the design. In this stage, usability testing reveals the local food map's usability by examining whether the users succeeded in the tasks they set out to accomplish, identifying where they had difficulties, and determining the points to be revised. Therefore, this thesis derives recommendations to help users interact with the local food map interface more easily and efficiently, and also presents several practical suggestions for making a prospective local food map interface user-friendly.

1.3 Outline of the thesis

This thesis begins by discussing why local food is important to people and how, based on people's social practices, this subject can be brought to people's digital lives. This focus leads to research on the role of consumers and producers at farmers' markets in buying/selling local food, which is then placed at the centre of this study. In this regard, this thesis poses research questions in Chapter 1 that explore how a digital local food map can be designed in a user-oriented way.

The second chapter initially discusses the definitions of local food, local food stakeholders and the role of farmers' markets in sourcing local food in the UK. The second part of this chapter considers how technological needs associated with digital maps have changed throughout the years and identifies the needs of current maps. Following this, Chapter 2 develops a framework to design a local food map from the information designers' point of view, considering the methods promoted by information design and user-centred design. Finally, it discusses the symbol design on maps by overlapping literature on the two disciplines of information design and cartography.

Chapter 3 of this thesis examines in detail the methods used in this research. It first justifies the research area with the visual communication and visual thinking method and examines the user demographics in the three counties: Berkshire, Hampshire and Oxfordshire. User research steps are then carried out with observations, surveys, and persona and user scenario development. The following method, the visualisation workshop, focuses on symbol design on maps and investigates local food map interface design with information designers. Finally, usability testing is applied to determine whether the symbols derived from the workshop successfully help people find information on local food maps.

Chapter 4 draws attention to the rural areas in the UK because of their proximity to local food retail places. In this regard, the definition of rural areas in this chapter is guided by government

documents. There is then an overview of research into the rurality in the three counties – Berkshire, Hampshire and Oxfordshire – to determine a geographic area for this research. After deciding the geographic area, this chapter defines choropleth maps and examines the population in the three counties by visualising the two data sets – age distribution and income level data – on choropleth maps focused on the users.

In order to gain a deeper understanding of local food map users, Chapter 5 focuses on the user research steps, which are observation, survey, and persona and user scenarios development. These steps feed off each other during the design cycle. The user research study clarifies the needs of local food map users and poses the requirements for a user-friendly local food map. The further studies are built on the user research carried out in this chapter.

In Chapter 6, the way in which the design approach contributes to cartography is examined, explicitly concerning the visualisation solutions that encourage people to locate information on local food maps. The chapter focuses on the design practice undertaken by an online visualisation workshop involving information design practitioners. The workshop investigates the interface elements of local food maps – map symbols, graphical variables and labels – and aims to promote the functionality and usability of the local food map design.

The study described in Chapter 7 focuses on design development and production of the prototype to get feedback from the target user group about interface elements created by design practitioners. The usability testing was devised to gain insights from local food map stakeholders to understand the functionality of the local food map's design elements, particularly symbols, variables and labels. This chapter reveals the principal findings of the usability test conducted with the actual local food map stakeholders and presents participants' choices for the symbols designed in the visualisation workshop.

The conclusion, Chapter 8, summarises the research approaches and practices used to create a local food map that is both intuitive and user-friendly. It also presents the key outcomes of this study

and indicates the contribution of the findings about local food map design research and practice to the literature.

2 Developing a framework for designing a user-friendly local food map

This thesis contributes to explorations of digital maps from the standpoint of graphic communication design. Handling a local food map as a piece of communication design research highlights maps' communicative role, one that helps people learn easily from well-organised information, use it comfortably, and engage with well-designed graphic representation. Thus, this chapter begins with literature on the definitions of local food, and the role of farmers' markets as local food stakeholders in finding local food in the UK. Following this, the study draws attention to the changing technological needs associated with digital maps over time. Next, the research approach is proposed, integrating the methods and principles suggested by information design and user-centred design to make the local food map user-friendly. Finally, the study handles the symbol design on maps by overlapping learning from information design and cartography literature in the context of interface design.

Information design, document design, graphic design and other related fields are almost all handled in the context of communication (Bateman, 2017: 221-222). Information design, which includes several terms, such as communication design and graphic design, 'identifies the problem and analyses the context and audience before shaping the message' (Spiekermann, 2017: x). This thesis recognises that the terms 'communication design' and 'graphic design' are interchangeable (Walker, 2017) and proposes that designers must consider the communicative aspects of maps. A thorough description is undoubtedly helpful when considering graphic design research because it includes what could be regarded as other fields, like 'typography, way-finding, book & periodical design, interaction design, illustration, exhibition design, branding and corporate identity' (Walker, 2017). Graphic design is certainly one of the ways to approach cartography. Walker (2107) notes that there are sub-disciplines of research

within each of these fields that focus on people, places, history, efficacy, theoretical frameworks, and the role of graphic design in more extensive cultural movements.

Information design is intended for people and benefits from people's knowledge, ability and experience while designing a product, service, material, or map. In this regard, a map that aims to provide effective communication should be handled within the design process from an information designer's viewpoint. This viewpoint is to simplify complex information by considering the user's needs (Black & Walker, 2016) within the design cycle. In the context of this thesis, it is first necessary to find a practical definition of 'local food', considering the people who are highly motivated to buy/sell local food, before expanding the research approach. Thus, the terms relevant to this study – and that have long been of interest in various fields – such as local food, local food stakeholders, community involvement, and farmers' markets, are discussed in the following sections.

2.1 Definitions of local food

A useful and applicable definition of local food is critical in determining the research's direction. However, as this section demonstrates, there are different interpretations of what 'local' means (Ostrom, 2013: 2), and some of those meanings are conflicting (Ostrom, 2013: 9).

Many published studies discuss the definition of 'local' (Ostrom, 2013: 9). The definitions in these studies indicate the meaning of 'local' as being between 12 and 30 miles, within a 200-mile radius and a day's travel, or as a location to which people can walk or bike (Ostrom, 2013: 2–9). Additionally, food must originate within a 100–200-mile radius for specific groups of people, such as locavores (Ostrom, 2013: 2).[1] These definitions can help reduce environmental impact while also framing the meaning of 'local'. Besides, local food preference is mainly motivated by belief in higher quality, which means taste, freshness, healthiness, environmental friendliness, etc. (Meyerding et al., 2019). Another

[1] People who eat mostly locally grown food are known as locavores.

significant aspect when addressing locality is the desire to support local businesses (Meyerding et al., 2019).

Many consumers believe growing local food regionally would be possible (Meyerding et al., 2019). Following are the explanations for choosing local food, according to a survey of 1011 UK customers conducted in 2007 by Farmers Weekly Group to better understand consumer motivations (Kemp et al., 2010):

- *tastes fresher than alternatives (agree 77%; disagree 19%; do not know 4%)*
- *is better for my health (agree 67%; disagree 27%; do not know 6%)*
- *is produced to higher animal welfare standards (agree 64%; disagree 24%; do not know 12%)*
- *is produced to higher hygiene standards (agree 58%; disagree 30%; do not know 12%)*
- *is trusted more by consumers than imported food (agree 82%; disagree 15%; don't know 3%)*
- *results in lower fuel emissions due to less transportation (agree 88%; disagree 10%; do not know 2%)*
- *helps support local producers/farmers (agree 96%; disagree 3%; do not know 1%)*

The research on local food showed that the term is clearly associated with freshness, taste, healthiness, support for local businesses and lower fuel emissions. As a result, this study takes these issues into consideration when considering local food in order to suggest a practical approach to the meaning of 'local'.

Moreover, various branches of literature emphasise the diverse aspects of local food. One significant issue regarding the economic aspect demonstrates that consumers are concerned with more than the product price and also think about whether products are environmentally friendly (Meyerding et al., 2019). According to a supporting study by the Department of Environment, Food and Rural Affairs, purchasing locally grown food is a 'top priority' for nearly 80 per cent of UK consumers (Askew, 2015). Moreover, when given a choice, 40 per cent of people preferred local meat, and 51 per cent preferred local vegetables. (Askew, 2015).

Food miles are also one of the main arguments for choosing local food. In this regard, 'Local food is miles better', as stated by the UK Farmers Weekly 2006 advertising campaign that raised the issue of food miles (Kemp et al., 2010). Compared with the negative impacts of the global system, farmers' markets, farm shops, box schemes, and community gardens can be identified as alternative local food points (Harvey, 2008) that meet the aforementioned consumers' concerns about taste, freshness and healthiness. These polemical discourses aside, the food miles concept needs to be handled in a broader context in the UK.

Transportation types to transfer products from one country to another are also becoming another pressing issue because of carbon emissions concerns (Kemp et al., 2010). When comparing the carbon footprint of products transported by sea versus by air, it was discovered that the latter has a smaller impact on climate change (Kemp et al., 2010). 'Since 50% of vegetables and 90% of fruit consumed in the UK are imported' (Kemp et al., 2010), transportation is becoming a more pressing concern when considering food consumption. However, it can be difficult to calculate carbon emissions, so emission-free purchases might not be feasible. For example, customers' round-trip distance cannot exceed 7.4 km because many food suppliers typically have lower carbon emissions than this (Kemp et al., 2010).

To summarise, it is unlikely to be possible to base this research on a single definition, as local food is centred around many concerns. This study concludes that the meaning of 'local food' is primarily influenced by consumer concerns about 'freshness, taste, healthfulness, hygiene standards, animal welfare, carbon footprint, trust, reduced fuel emissions, well-being, and sustaining local businesses' (Kemp et al., 2010). However, the literature on local food has illustrated that food consumption differs between rural and urban consumers in the UK and is affected by other factors, like social class and age (Kemp et al., 2010). Thus, this study briefly reviews local food stakeholders before directing local food research to farmers' markets.

2.1.1 Local food stakeholders

The methods applied by information designers propose involving stakeholders in the design cycle (Sless, 1992). Supporting this, the research on cartography indicates that interactive maps might work well for specific target user groups but not support other users and use case scenarios (Roth et al., 2015). Considering these points, the local food system can be described as a large mechanism comprising stakeholders in the production, supply chain and consumption stages. This thesis focuses on the target user group (consumers and vendors at FMs), an important segment of local food stakeholders. It identifies the need for local food map design based on the demands of the stakeholders – that is, local food buyers and sellers in FMs. This section reviews the target user group's (consumers and vendors at FMs) position with the other stakeholders within this mechanism and the rationale for the target user group selected for this research.

Designing information begins with defining the problem, and it continues with involving users in the process (Boag, 2017 cited Sless, 1994). Stakeholder engagement is an affirmed step for developing solutions as people's attitudes and views are included in the solution as it is developed (Black 1998; Leonard and Rayport 1997). A stakeholder is someone who has to be involved in the project in some manner or who has an interest in it (Rosala, 2021). A stakeholder study is usually conducted to collect initial information about the target user groups before the user research (Ross, 2015). In this regard, the main elements of production, supply chain and consumption stages divide the stakeholders in the local food system (Fig. 2.1 below). Consumer and vendor groups that significantly impact the target user research in this thesis are aggregated at the end of production and consumption stages, such as individuals (consumers, farmers, etc.), local communities, farmers' markets, and local shops (Fig. 2.1 below). This overview indicates that some stakeholders may actively participate in multiple stages. For instance, farmers' markets and online initiatives can participate in both the end-of-production and end-of-consumption stages (Fig. 2.1 below).

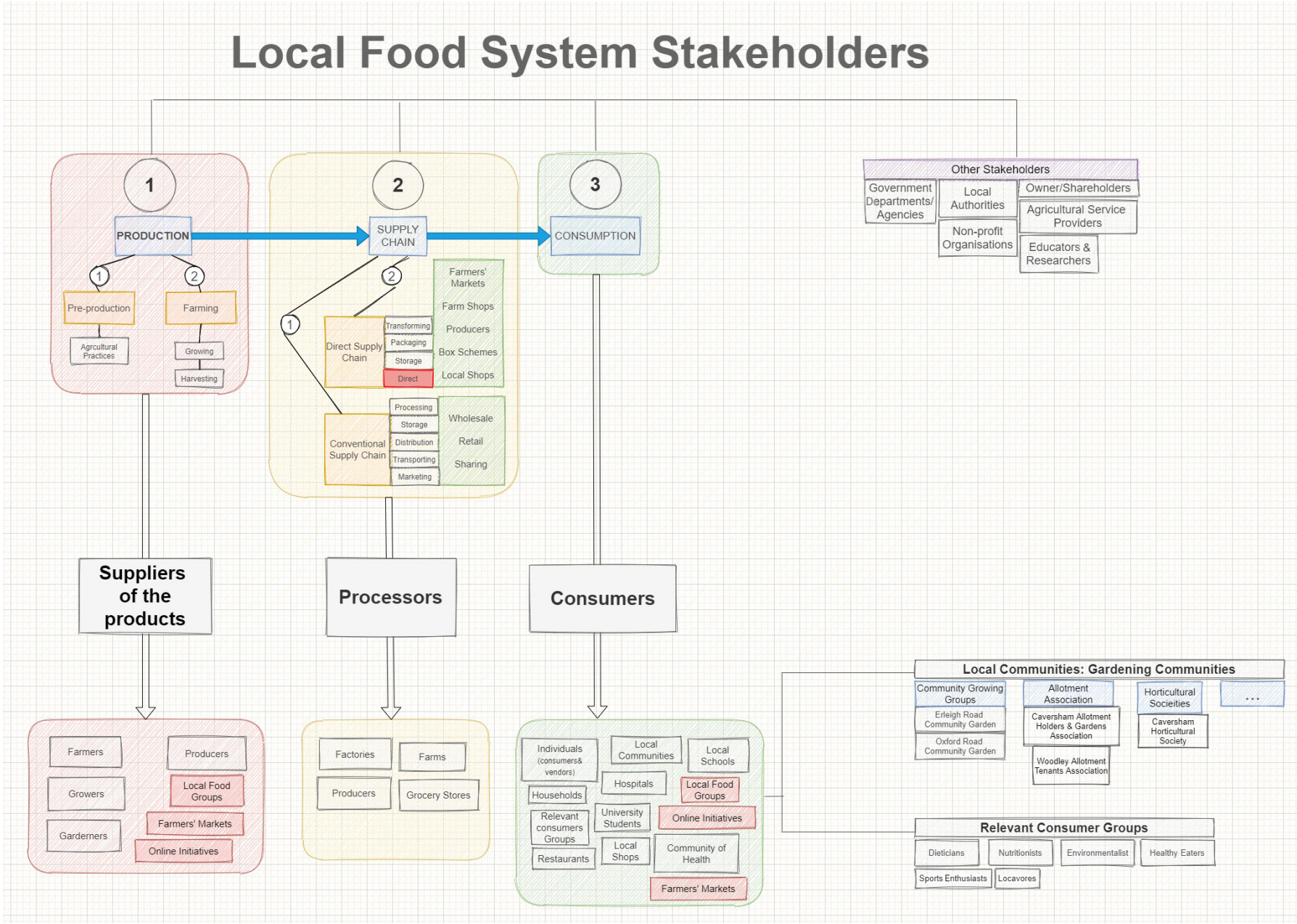


Figure 2.1 Local food system stakeholder mechanism drawn by the author, considering all stakeholders in the production, supply chain and consumption stages.

Further, the individuals such as vendors and consumers could participate in various sub-relevant groups in the local food stakeholder mechanism. A consumer, for instance, could also be clustered in both the gardening community, like the Horticultural Society, and in a relevant consumer group, like the Healthy Eaters (see Fig. 2.1 above for the Local Communities: Gardening Communities and Relevant Consumer Groups: Healthy Eaters). Likewise, a consumer/vendor keen on local food can prefer to eat in local restaurants and participate in one of the relevant consumer groups in Figure 2.1. Therefore, this overview reveals that individuals (consumers and vendors) may have the same interests, follow similar ways to find local food and engage with the same institutions and places, such as farmers' markets and local food shops. While external stakeholders such as government departments and local authorities can be considered the largest cog in the mechanism, this research stage aims to find individuals and the most relevant groups who will use the map system to find locally produced food.

To conclude, this section has attempted to briefly summarise the relevant stakeholder groups for the local food map. The stakeholder review indicates that the local food system will involve many stakeholders with different roles in the production, supply chain and consumption phases. The target user group in this research, vendors and consumers, can play an active role in different stages of this system, which includes local food supply and consumption. In addition, this framework showed that farmers' markets are both an essential component of the local food system on their own and an important meeting point that brings together consumers and producers.

Thus, this research focuses on consumers and vendors, who are the primary stakeholders of the local food system at FMs when deciding on the specifications for a local food map. These people may be possible users of the local food map who have a central perspective. Hence, the section below overviews the farmers' markets in the UK where people buy and sell local food.

2.1.2 An efficient way of buying/selling local food: farmers' markets

Farmers' markets are at the heart of buying/selling local food as FM products are the preferred local food of almost one third of the population in the UK (Harvey, 2008: 252). In this regard, shopping at FMs reduces the anxiety about the products' localness, provides a meeting point for the community (producers and consumers) and frames the meaning of local concerning geographical restriction.

Visitors to FMs may do so for various reasons, but consumer demand for high-quality food may be the primary driver. This is because many local food concerns revolve around 'the higher quality of food' (Meyerding et al., 2019). Sirsat, Gibson and Neal (2015) stated that patrons of FMs assume that local products are environmentally friendly. This statement is supported by the fundamental tenet of farmers' markets, which states that all food sold must have originated from a farm 'often within 50 miles' (Harvey, 2008: 253).

Farmers' markets also offer customers the chance to connect with neighbours, engage in ongoing interactions with locals, and provide access to fresh products in a social setting. In this regard, a local place is defined as being sufficiently small to preserve a 'sense of place' and inspire participation (Moseley, 2003: 8). The feeling of place also creates communities. Butcher describes the community as a 'hoorah' word that evokes positive feelings (Moseley, 2003: 73 cited Butcher, 1993). According to Rogers (Moseley, 2003: 73 cited Rogers, 1993):

> *the rural community is seen as the essence of the English good life – a collection of people well integrated into their local society and their environment and living productive and rewarding lives.*

In this regard, locals belonging to a community can provide valuable ideas for gaining local knowledge (Moseley, 2003: 135). Locals, a group of people who live in a proximity area or have a 'sense of place', also have a chance to voice their ideas, discuss

their needs and positively affect proposed policies or actions. In this vein, FMs can be defined as a location where rural-related and close-knit communities produce and consume locally produced food, share their experiences, and strengthen the community spirit. Thus, being part of the same community also points out one of the primary consumers' motivations for visiting the FMs, which is to support the local businesses (Meyerding et al., 2019).

To summarise, FMs play a key role in both their easy access to local food and as a context for discovering the importance of community involvement in a preference for local food. Thus, in the further stages of this study, a survey is conducted to gain further insights into local food by addressing FMs as places for buying and selling local food (see Chapter 5 for the survey).

2.2 Identification of the needs for digital maps

This section highlights the development of maps through time and draws attention to the gaps in the design process of digital maps today that need to be addressed in user interface design and usability.

Cartography has a long history of visualising the world (MacEachren & Kraak, 2001). Throughout this long journey, the general purpose of maps has remained the same: to provide information about the world (Darkes & Spence 2017: 15) and geographic reality (Kraak & Brown, 2001: 11) to map readers/users. The research into map making – understanding map applications across the different genres, printed or digital – has continued to evolve parallel to this goal. Besides, 'the technological, scientific, and social environment' in which maps are created has changed with the development of technology over the past twenty years (MacEachren & Kraak, 2001).

Historically, maps are classified according to their purposes, such as topographic and thematic maps (Tyner, 2015, 24). Further, special-purpose maps call for specific user groups and use, such as recreation area maps and tourist maps (Tyner, 2015, 24). Today,

special-purpose maps are frequently used in everyday life, namely digital maps and location-based applications that employ a digital map as a flexible interface (Roth et al., 2015). Map users using these maps/applications tend to get information about a route on maps when looking for an address. In fact, map use today can basically be circumscribed by users' spatio-temporal questions regarding daily purposes, such as: Where is the closest Tesco? How do I get to the nearest pharmacy? Where is the Covid-19 testing centre? This drives the third research question: **How can digital food maps be designed to reflect the needs of local food map users?** It is clear that today's digital world demands maps created with users' daily needs in mind. However, although cartographic research has recognised the contribution of user experience to map interaction in a communicative context in recent years, a user-centred approach that would focus on the target user group to make maps user-friendly is still uncommon in cartography. One current reason seems to be that there is no practical guideline in practices for creating interactive maps and visualisations (Roth, 2013). In this context, one of the critical issues for designers is how to fulfil user needs in the development process in order to achieve the best possible user experience.

Further, cartographic practices theoretically outline the map-making stages by asking who the target audience is, what the map viewing environment is, what the map format is and what is included in the map layout (Darkes, 2018, 288). However, this outline highlights designing the information with a focus on technical or aesthetic concerns rather than the functionality of the design. The critical problem with this is that most maps reflect the map maker's perception instead of including end users in the map-making process (van Elzakker, 2004). Making the map is the main goal, and the users' needs are overlooked (van Elzakker and Ooms, 2018). The reason for this general approach, which ignores the relationship of functionality with the user, may be related to the history of cartography, in which map-making seemed to be at the sole discretion of the cartographer or the software used today that facilitates map-making. This design practice only emphasises the application of cartographic conventions and leads to a one-sided communication by overlooking the communicative role of digital maps. In order to enable two-sided communication through map interfaces, there might need to be a shift from

supply to demand. The demand emphasises the importance of users' needs rather than cartographers' decisions.

In addition, data visualisation in cartographic practices is concentrated in specific design issues directly affecting the representation, such as (1) data quality, (2) generalisation and (3) symbolisation (Darkes & Spence, 2017).
(1) The data quality involves several characteristics, including currency, completeness, correctness, and precision (Darkes, 2018: 291). These characteristics increase a map's credibility and affect its usability.
(2) The generalisation process, as a part of data visualisation on maps, is a critical stage of mapping and a handy design component. The generalisation stage brings diverse techniques – simplification, exaggeration, displacement, merging and classification – that transmit necessary information with relevant detail (Darkes & Spence, 2017: 42, 43). Map generalisation simplifies geographic data representation (Ruas, 2008). Cartographers use generalisation techniques to make the data more readable. For instance, some objects can be eliminated and/or enlarged to be readable on a smaller scale (Ruas, 2008).
(3) In maps, symbols carry information as particular visual representations and facilitate the presentation of messages more concisely (Boersema & Adams, 2017: 305). However, regarding the comprehensibility of symbols, it is clear that establishing a single symbol standard for maps is impossible (Robinson et al., 2011). In this context, the contribution of information designers to making the design suitable for the public in everyday life (Black & Walker, 2016) can be critical. That is because information designers consider the users' needs in the research and make the design suitable for them, taking into account the users' feedback.

Further, three points put forward by cartographers illustrate that the capabilities of digital maps regarding their communicative aspects and visualisations are still being investigated. The first point indicates concerns about interface design with 'inappropriate generalisation, incorrect normalisation or classification, and illogical or unclear symbolisation' (Roth et al., 2015). The second point relates to usability; maps may be difficult to navigate, have unexpected functionality, or be hard to use (Roth et al., 2015). The final point is that maps may work well for specific

target user groups and particular tasks but not support other users and use-case scenarios (Roth et al., 2015).

In order to improve the usability of digital maps, several studies suggest designing exploratory interfaces based on user research studies, such as participant observations, questionnaires and performance measurement tests (Roth et al., 2015). An example of these studies is a mobile geo-application study to improve pedestrian navigation (van Elzakker & Delikostidis, 2010). Here, the researchers investigate the interface design of the pedestrian navigation system regarding 'the use, user and usability research' and employ the methods promoted by user-centred design. Similarly, Dixon (2018) focused on interface design for a navigation system by developing and testing a prototype that aimed to make walkers aware of the environment while using the navigation application, using user-centred design methods. In addition, studies on location-based information visualisation highlight the lack of public involvement (Genç et al., 2015). In this regard, Alamäki (2015) draws attention to the effectiveness of the UCD methods and the involvement of stakeholders in both design and evaluation actions in the mobile application design study.

Moreover, the research that aims to improve maps' communicative aspect and visualisation collated many methods. The research on maps in recent years draws attention to the design cycle, where it is investigated how people's needs should be brought to the visualisation stage (by using user research methods, such as questionnaires, interviews and focus groups) (Roth et al., 2015). These studies point out 'user personas and use case scenarios to keep in mind who the product/map is for' (Roth, 2019) in the design practice. Further, design-oriented cartography research, which proceeds by following a mixed methodology, has carried out design practice with collaborative workshops by practitioners/students in the field (Genç et al., 2015). These workshops aim to increase the interfaces' effectiveness and user experience.

To conclude, this research acknowledges that the everyday use of digital maps brings about new interface design and usability problems because of the nature of widely used technology (Roth et al., 2017). In this regard, maps that do not consider the three points

above are likely to result in a frustrating user experience for their users. From these three points, it is clear that there is a need to improve the usability of the maps to achieve the best user experience in digital maps and increase the quality of user interaction. In addition, these problems make the potential contributions of other disciplines to cartography visible. In particular, the three points described – interface design, usability, and user-oriented needs – increase the interest in research into the relationship between cartography and information design, as well as user-centred studies. This thesis focuses on the communication between map users and map makers by applying methods suggested by information design and user-centred design to develop an effective design process. The following section discusses the research approach of this thesis that can be adapted to cartography to design a user-friendly local food map.

2.3 Research approach to designing a user-friendly local food map

This research investigates the type and nature of map information that would be more applicable to local food map users and focuses on the usability of a potential local food map in this context. Usability studies are intended to determine how convenient and effective a product is for its users. The definition of usability is how easy a product is to use, which makes the product user-friendly (Jordan, 2002). The International Organization for Standardization (ISO) defines usability by its success in terms of effectiveness, efficiency, and satisfaction (Jordan, 2002). Effectiveness can be identified as achieving a task successfully; efficiency is performing the tasks with less effort; and satisfaction is how happy users are to use the product or service. By considering these components, this research draws attention to alternative design methods to make the information applicable and increase the usability of the local food map design.

To improve the usability of a product, all stakeholders in a project, an organisation, or a field can benefit from user experience models and techniques (Codecademy, 2023). Such methods include design thinking, double diamond, design sprint, user-centred design, etc. These methods used in information design

studies aim to propose a user-oriented approach and turn a need into a demand (Mendonça de Sá Araújo et al., 2019).

The design thinking approach is a creative way to solve problems (Ideo Design Thinking, n.d.). This approach helps solve unknown problems, called 'wicked problems', by refocusing them from a user-centric perspective (Interaction Design Foundation, 2016c). In order to solve a problem with a design thinking approach, five steps are embraced: emphasise, define, ideate, prototype, and test. Through these steps, design thinking guides an iterative process in which the design team understands users, mitigates assumptions, redefines problems, and develops innovative solutions to prototype and test (Interaction Design Foundation, 2016c).

Although the design thinking approach has several patterns, they all seem to adhere to the double-diamond practice (Mendonça de Sá Araújo et al., 2019). The Double Diamond Model, first proposed by the British Design Council in 2005, delivers divergence and convergence scope for the design problems and solutions that designers engage with and broadly examines the underlying design issues and potential solutions (Norman, 2013: 220). The first diamond refers to gathering the insights from the stakeholders by diverging the problem stage, followed by converging through examining the insights gained by stakeholders and revealing the real problems (Mendonça de Sá Araújo et al., 2019). The second diamond follows the same divergence and convergence scope and elucidates possible solutions to be prototyped and tested (Mendonça de Sá Araújo et al., 2019).

The design sprint is a process created by Google and follows six phases: understand, define, sketch, decide, prototype, and validate (Design Sprints, n.d.). These phases are intended to be completed within a week by the team (Mendonça de Sá Araújo et al., 2019). In parallel to other methods, understanding user needs occurs early in the design sprint method, and the problem-solving stages come after. By following the six phases in the sprint process, the design team benefits from a variety of techniques, such as user journey mapping, user interviews, solution sketches, storyboards, prototypes, and usability studies (Design Sprints, n.d.). All the methods above create an appropriate framework to fit the

problem, reveal the challenges, create possible innovative solutions, develop a prototype, and test it.

This thesis embraces user-centred design among the above design methods to make the information applicable and the local food map design more usable. User-centred design identifies the iterative nature of the design process, where designers focus on users and their needs, experiences, and feedback until the last stage of the design cycle. In this thesis, the user-oriented approach assists in understanding local food map users' needs and responding to them, considering their feedback in the design cycle. In the context of user-centred design, it is also relevant to consider two significant design concepts during the development phase of this thesis: user interface design (UID) and user experience (UX). The user interface is a digital product or service with which a user interacts. It should present the information accurately and be usable (Interaction Design Foundation, 2016b), and its content should be explicit and appropriate. Concerning user interface design, Walker (2001) also suggests that both experts and non-experts can seek guidance on legibility and readability from user-centred research. Further, user experience is applied to make the product or service suitable for the users and improve the interface design's appeal and functionality. In order to provide a good user experience, information designers keep in mind throughout the design cycle that they design every product or service for people and should consider their experience, knowledge, and abilities. In this regard, this research, which aims to make local food map design more functional, adopts a user-centred approach and allows for tailoring the design in a user-oriented way. It explores making the user experience simple, straightforward, and efficient. The following section discusses how this research follows the steps suggested by information design to create a user-friendly local food map.

2.3.1 Design practice

This research explores making the information/message more applicable for local food map users. Black et al. (2017) remark that information design can also be adapted to wayfinding and map design. The possible reason might be that the process of designing a map can be considered as being parallel to the process of

creating a product or service. Both inform people about a specific context and await an interaction from them. The purpose of UX applications is to design products and related services in a way that improves user interaction with them. In this context, landmark-based navigation maps/systems should be designed considering users' needs, and their interface languages need to be simple and straightforward for users to interact with them easily. Thus, focusing on local food map design, this thesis uses the methods proposed by information design to achieve the best user experience.

Information design applies standard problem-solving methods to make the information applicable to users and usable by them (Sless, 1992; Black & Walker, 2016). According to Sless (1992), the methods applied by information designers move forward as follows:

> *(1) defining the problem, (2) involving all stakeholders, (3) observing and measuring the current state of things, (4) development and testing of prototype solutions, (5) iterative development and testing of prototypes until an optimum solution is found, (6) implementation and monitoring of the solution in use.*

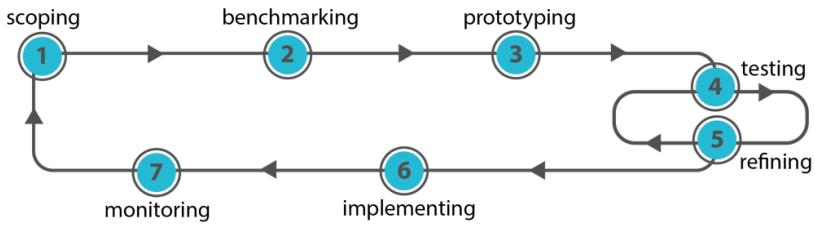


Figure 2.2 Diagram of the iterative design process, redrawn from Sless (2008, 252).

The steps in Sless's diagram also illustrate that design is entangled with the research in the process, and the process enables 'measuring the quality of the communication practices' (Fig. 2.2).[1]

[1] Sless (2008) noted that information design establishes standards, enhances public communication and serves as a foundation for institutionalising effective public communication if it follows all the steps in Figure 2.2. By doing so, information design provides a standard that can measure the communication quality.

In parallel to Sless's diagram, the design process in research for information design mainly encompasses studying problems, generating knowledge, and evaluating the results (Frascara, 2015). Frascara (2015) describes the design process with nine steps:

> *(1) contact with the client (or identification of a need), (2) collection of information (publications, experts and users), (3) development of the design strategy, (4) design development and production of prototypes, (5) evaluation, (6) redesign, (7) fabrication and implementation, (8) evaluation of final performance, (9) design revision/adjustment.*

Steps 4 and 5 elucidate the design process, which has an iterative nature (Frascara, 2015).

This thesis follows the first five steps of Frascara's (2015) guidance when investigating a user-friendly local food map design. It encompasses (a) reviewing government documents, choosing a research area and examining the demography in the research area, (b) collecting information in the research area to understand the user needs by carrying out an observation stage and a questionnaire, and also extending user research by developing personas and user scenarios, (c) development of a design strategy with a visualisation workshop, (d) development of a prototype, including the visualisation outcomes, (e) evaluation of the prototype with a usability test (Fig. 2.3).

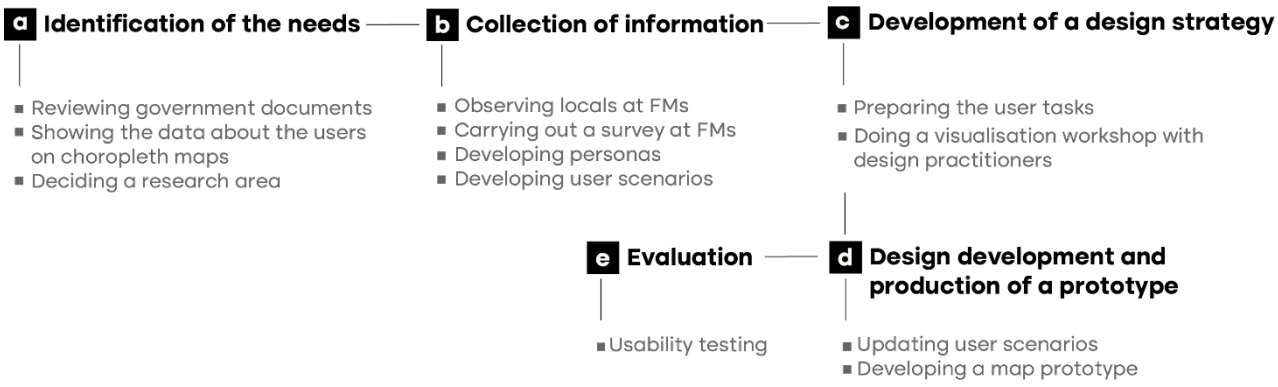


Figure 2.3 The thesis structure, showing five steps in the design process and the studies carried out under each phase.

Therefore, this thesis structure follows the methods proposed by information design while investigating how to design a prospective local food map in a user-oriented way. The following section addresses the interface design that will affect the success of a prospective local food map, considers the design criteria, and discusses the symbol design that this thesis focuses on in the design development process, considering the literature in two disciplines – information design and cartography.

2.4 Developing interface design

Symbolisation is the main focus of the visualisation stage of this research. Symbols designed in the visualisation workshop are handled as the user interface elements of the prospective local food map. This thesis acknowledges that clear, legible and compatible symbols will affect the success of a local food map interface. However, as mentioned, it is evident that establishing a single symbol standard for maps is not possible in terms of comprehensibility (Robinson et al., 2011). The likely reason is that symbol design that aims to create effective communication depends on the design process as shaped by (1) the design capability of the sender and (2) the interpretation ability of the receiver. In this transmission, clarity is the primary purpose of information design (Pettersson, 2016). In addition to clarity, the usability of information is affected by 'the reader's motivation, the reader's knowledge, the actions through which the reader obtains the information, and the actions the reader must undertake to use the information' (Frascara, 2015). So, in the context of effective communication, a user-friendly local food map needs a symbolic language that considers its users' needs, avoids ambiguity and eliminates unnecessary information, promoting clarity, legibility and functionality in design. Thus, the following sections provide an important opportunity to advance the understanding of design criteria and discuss the application of symbols, variables and labels on maps.

2.4.1 Design principles for cartography

Today, cartographers who use various symbols for mapping requirements must be able to create comprehensive geographic

information products that map users quickly understand (Robinson et al., 2005). This necessity requires the collaboration of several elements, including communicative, aesthetic, technical and practical factors. Considering these factors, this thesis proposes that the information design approach would increase the effectiveness of the communication between map users and mapmakers, as well as map functionality. That is because typography and communication design are used by information designers to logically organise and express information while keeping in mind the users' needs and use conditions (Walker & Barratt, n.d.). Thus, this section discusses the principles proposed by information design that would be adapted to cartography.

Pettersson (2016) distinguishes the information design principles as functional and aesthetic. The functional principles begin with *defining a problem* and *providing a structure*. These stages in this thesis define the problems in everyday maps in the context of effective communication and consider this context while thinking about a local food map. In doing so, the study seeks to understand who the local food map users are, explores their characteristics and needs and determines the requirements of a prospective local food map.

Further, Pettersson (2016) draws our attention to the sender, representation, message, medium, receivers, and context in the initial stages. These factors are likely to improve effective communication between designers and map users. In this vein, communication is traditionally defined as an activity that takes shape between sender and receiver (Pettersson, 2002, 22; Sless, 1981: 24). The transmission of the message between sender and receiver is constructed on the 'representation' (Pettersson, 2002, 22; Sless, 1981: 24), where the message is loaded. Pettersson (2014) highlights the importance of the designer's role (sender's) and implies that practices, where the sender prepares the message, will be more challenging to understand if complex language is used in the texts or images. So, the sender's (designer's) capability would influence the message itself and the receiver's ability to interpret it. According to Spinillo and Dyson (2001), a picture's ability to effectively transmit information also depends on how well it fits the material being sent and the reader's domain, including their information demands and experience with graphic

representations. Besides, the familiarity of the receivers with the message's visual presentation is also important to pictorial communication (Spinillo & Dyson, 2011). In this context, the meaning of the symbols – on a café door or a map – must be clear to the recipient for communication to be effective (Abdullah & Hübner, 2006: 15).

The other functional principles provide *clarity*, *simplicity, emphasis* and *unity* (Pettersson, 2016). These principles assist information designers in designing the information as simple, straightforward, clear, and as transparent as possible (Pettersson, 2016). These principles enable the graphical elements to effectively work with typefaces, contrast, colour, layout, etc. In order to increase legibility, typefaces for on-screen maps should be adjusted for the screen, and contrast should be considered. Likewise, graphical elements should be large or bold to be read easily. This consideration impacts the simplicity that can only be obtained with comprehended content and representation (Pettersson, 2016). That is because simplicity necessitates avoiding unnecessary text and image details (Pettersson, 2016). Emphasis stands out as another beneficial principle related to contrast, and that is to draw attention. The last functional principle, *unity*, calls for consistency in layout, typography, and all the graphical elements in information material.

The aesthetic principles include *harmony* and *aesthetic proportion*. Harmony, as it relates to unity, defines how well the design elements work together. The issue of aesthetic proportion is mostly subjective and is measured by the user's response to the design. However, information designers, for instance, use colour carefully to avoid ambiguity in their cognitive and decorative corresponds, which supports both harmony and aesthetic proportion (Pettersson, 2016). Therefore, these principles indicate the functionality of any information material, and they are expected to be considered by information designers in design practice. The following section handles symbols, variables and labels on maps, which can be view as overlapping information design principles and cartographic conventions.

2.4.2 The use of symbols, graphic variables, and labels

> *Maps are symbols: the assortment of individual symbols that are inherent to a map together construct a holistic symbol of its subject* (Kent, 2018).

The visualisation stage of this thesis focuses on designing interface elements of a prospective local food map and investigates whether providing accurately designed information about locally produced food on a prospective local food map will encourage people to use it. Here, the data visualisation stage seems crucial to exploring the link between information design and cartography, in which interface design practice intertwines the two disciplines. Thus, the following sections focus on data visualisation practices in cartography and discuss the literature on symbols, graphic variables and labels as a user interface element by overlapping the principles of the two disciplines.

2.4.2.1 Symbols

The visual coding of information is symbolisation (Kent, 2018: 303). All maps are constructed using symbols known as the language of maps (Tyner, 2015: 26). Symbols are the carriers of information as particular visuals on maps and allow a message to be presented more concisely (Boersema & Adams, 2017: 305). Therefore, all maps need logical linkage built on represented things at different levels of abstraction through the symbols for what is relevant to the symbolised things (MacEachren, 1994: 56).

The criteria for designing successful symbols in the design literature is handled with a broad perspective 'from alerting value to legibility, comprehension, and finally compliance' (Boersema & Adams, 2017: 305–306). It is necessary to consider the meaning of symbols before moving on to designing successful examples. Icons are commonly referred to as symbols, pictograms, or pictorial symbols in different settings (Black, 2017). Harris (1999: 386) states that icons are used as symbols in graphs, charts and maps. Pierce distinguishes the signs as icon (resemblance), symbol (convention) and index (essential connection) in the semiotic context (Abdullah & Hübner, 2006: 11). Pictograms and icons are graphical signs,

which is the one thing they have in common (Abdullah & Hubner, 2006: 6). Pictograms, unlike icons, must be purposefully recognised and culturally independent in order to get to the heart of the problem by visually displaying the information (Abdullah & Hubner, 2006: 6; and see Fig. 2.4). By acknowledging that symbols have different meanings and definitions, *this research defines symbols on maps as graphical elements that users easily associate with the symbolised things.* In the context of this research, a local food or farm symbol should evoke a connotation with local food in users' minds.

Figure 2.4 Examples of pictograms showing showers, lift, male WC, cleaning of laboratory apparatus and WC for public services, designed by Professor W. Herbert Kapitzki; image adapted from Abdullah & Hubner (2006).

Information design defines the basic components of a symbol as dot, line, and area (Pettersson, 2002: 115). Symbols in three dimensions also have volumes (Pettersson, 2002: 115). Dot corresponds to point in cartography. Similarly, map symbols are deemed to fall into four geometric categories: point symbols, line symbols, area symbols and volume symbols (MacEachren, 1994: 14; Harris, 1999: 380). However, the most common forms of symbols on maps are point, line, and area (Tyner, 2018: 444).

Point symbol: Each point has a precise position within a particular context and is defined by the intersection of two very thin lines (Pettersson, 2002: 115). A point has neither area nor length; it denotes a specific place on a flat surface (Bertin, 2010) and individual items, such as the location of a food shop or train

Figure 2.5 Examples of point symbols showing typical stops, such as McDonald's and Peru Rail Office; a digital map retrieved from the Mapbox Docs website, (n.d.).

station, can be represented by a point symbol on maps (Kraak & Brown, 2001: 60) (Fig. 2.5).

However, in symbol design, the information can be represented with various levels of abstraction, from geometric/abstract to pictorial/mimetic. The visual presentation decision on symbol choice is subjective and belongs to the designer (MacEachren, 1994, 14). MacEachren (1994: 14) stated that the degree of abstraction goes from images with no independent identification to graphics that comprise prominent symbols based on conventions. In this context, point symbols can be pictured with arbitrary levels of abstraction, such as images/pictures, sketches and graphics (Elias & Paelke, 2008; and see Fig. 2.6 below). In the comparison of abstract symbols with pictorial ones, the meaning of abstract and arbitrary symbols must usually be learnt (Wogalter & Mayhorn, 2017: 340) by users, while pictorial examples are more obvious.

Further, cultural variations influence how symbols are interpreted (Spinillo & Dyson, 200). People can have difficulty understanding the meaning of graphic symbols, as objects from different cultures differ significantly. For instance, while knives and forks may appear appropriate to depict

Figure 2.6 Examples of point symbols using different levels of abstraction; from left to right: images/pictures, sketches and graphics, adapted from Elias & Paelke (2008).

'restaurant', they wouldn't be for those who had only eaten with chopsticks (Dewar, 1998: 290).

As in the restaurant example, it has been understood that several public information symbols evaluated by the ISO vary between countries. The ISO, for example, developed a symbol to designate 'police' by using a hat worn by officers (Dewar, 1998: 290). However, throughout the world, police hats differed, and not everyone was familiar with the ones worn by the police in different countries (Dewar, 1998: 290). Considering such problems, symbols should therefore be created with the maximum level of comprehension and applicability in mind (Spinillo & Dyson, 2001), and consideration of how culture and context helps readers understand symbols (Dewar, 1998: 288) (see Fig. 2.7 below).

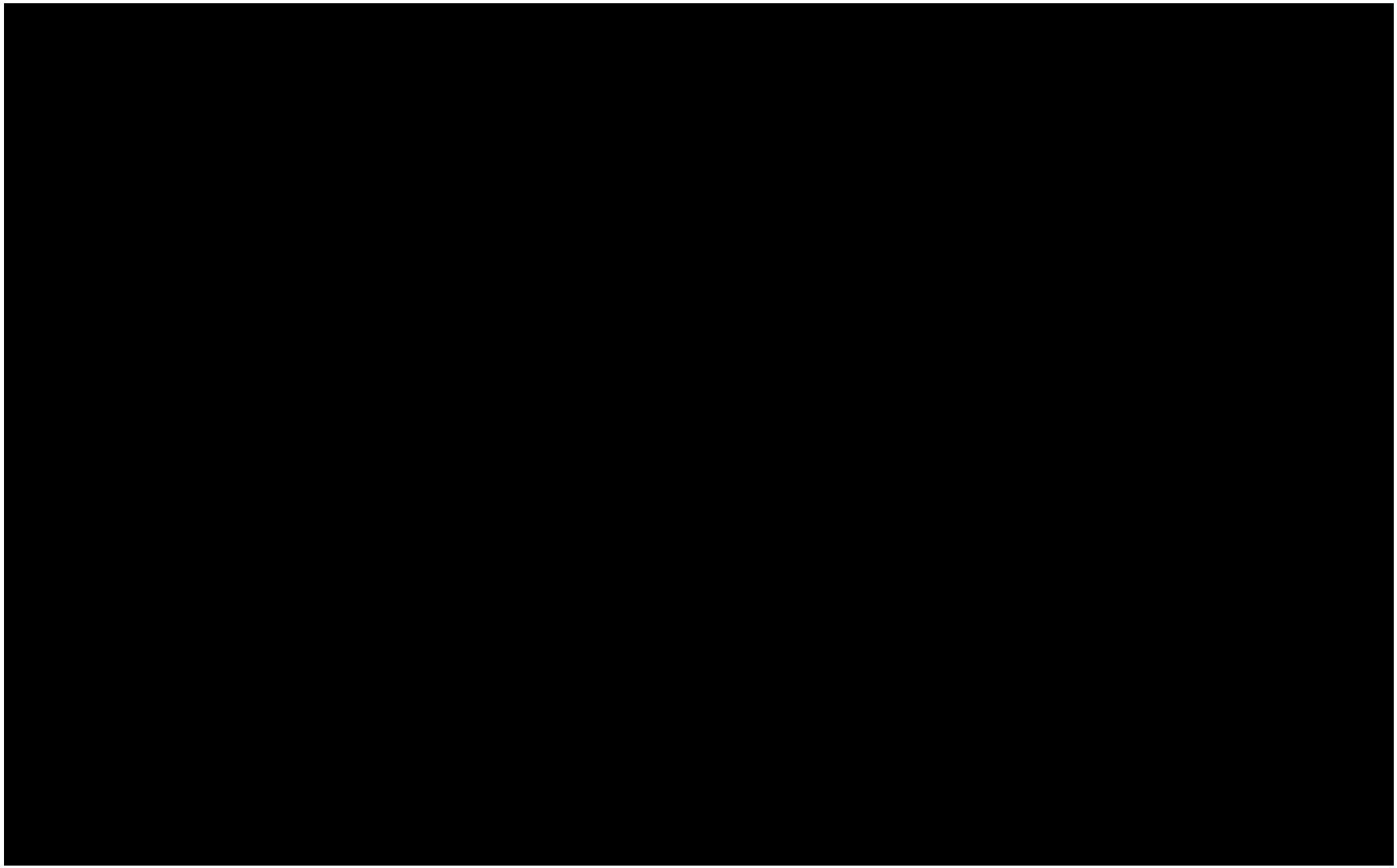


Figure 2.7 Examples of pictorial symbols providing information about animals, plants, and rivers jointly developed by the Waorani people belonging to the same culture in South Eastern Ecuador; an interactive map taken from Amazon Frontlines website, (2023).

In the graphical language, a basic filled square, for example, can represent a town, but adding a cross depicts a church (Darkes & Spence, 2017: 45). This transformation makes the symbol conventional or associative (Darkes & Spence, 2017: 45; Tyner, 2015: 27) and locates it between geometric/abstract and pictorial/mimetic (Fig. 2.8).

Figure 2.8 Examples of point symbols showing geometric, conventional and mimetic forms, adapted from Darks & Spence (2017).

The most commonly used forms of point symbols are pictorial/mimetic and geometric/abstract (AlHosani, 2009). The iconicity of a pictorial symbol is relatively high; conversely, if it is a geometric or abstract marker, it can be very low (Elias & Paelke, 2008; MacEachren, 1994). The benefit of pictorial symbols is that they are simple to recognise since no graphical interpretation is required (Elias & Paelke, 2008). Even though they may be distinguished from one another, the most abstract symbols have only arbitrary associations with the referents they represent (MacEachren, 1994: 56). Such arbitrary relationships aside, the user may find it challenging to relate, even if a symbol is pictorial. Frascara (2015) argues that effectiveness is the main factor when deciding whether to use a pictogram or a word. In other words, a pictogram should be as efficient as the word it represents. He also advises that a pictogram should typically be displayed alongside a word that describes it. On the other hand, symbols without words allow people who do not speak the same language to interpret (Dewar, 1998); in this way, they might have a chance to bring international uniformity to cross-cultural differences.

The assumption that symbols convey the intended information or message similarly to people of all languages may cause various other problems (Dewar, 1998). The primary challenge with graphic symbols is that users may not always understand what the

symbols mean (Dewar, 1998: 289). The existing body of design research on the comprehensibility of public symbols notes that specific characteristics symbols need to possess are being meaningful, easy to read (legible), simple to learn (learnable) and remember (memorable), and consistently utilised (Dewar, 1998: 298). These characteristics make it crucial for users and designers to have a shared understanding of the symbols they use to ensure comprehensibility and avoid confusion. One of the obstacles to forming this understanding is the lack of guidelines on issues such as the level of interpretation and readability/legibility distance (Dewar, 1998: 291). On the other hand, some organisations have developed globally recognised symbols and recommended standards for their comprehensibility. These standards specify that symbols should be at least 67 per cent and up to 85 per cent comprehensible, according to the ISO and the American National Standards Institute, respectively (Dewar, 1998: 291). Further, the ISO (1989) standard for public information symbols suggests that symbols scoring an *estimated* 87 per cent or more would meet the actual comprehensibility score of 66 per cent (Olmstead, 1998: 316). Beyond this, various techniques are employed to evaluate the comprehensibility of symbols, which can be classified into laboratory and field procedures (Dewar, 1998: 291). Regarding these procedures, subjective methods such as "clarity ratings, preference ranking, and expert opinion" are also used to assess performance or comprehensibility (Dewar, 1998: 291).

Zwaga (1989) used a new approach in his study of information symbols to convey participants' destinations in a hospital (Dewar, 1998: 292), in which estimation and comprehension data were collected separately and evaluated comparatively. In the estimation test, the participants were first informed of the meaning of the symbols and then asked about what they understood from the symbol's meaning. Following the estimation test, in the comprehension test, another group of participants was shown the symbols without them receiving information about what each represented, and asked to identify their meanings. The findings of this study showed high correlations between the estimated and actual comprehension levels for each set of symbols, ranging from 0.63 to 0.93 (Dewar, 1998: 292). This study also demonstrated that the comprehension estimation procedure could eliminate the need for additional testing of the really bad

and very good symbols (Dewar, 1998: 292). Further, Zwaga (1989) proposed using the ISO acceptance criterion of 67 per cent comprehension to assess the comprehensibility of symbols, and if an estimation score falls within an "uncertainty range" of 20 per cent around the 67 per cent ISO standard – so 47 per cent to 87 per cent – then a comprehension test should be conducted to verify the comprehensibility of the symbols (Dewar, 1998: 292).

Further, Olmstead (1998: 316) presents how the sample measure is simple, reliable, inexpensive, and ideally suited for studies examining the comprehensibility of symbols. This is evident in the example of patients and visitors to a medical facility in a large metropolitan area in the United States and China (Olmstead, 1998: 316). The patients and visitors were surveyed to understand the comprehensibility of 41 hospital symbols. This study determined the comprehensibility of hospital information symbols, considering cultural, gender, and age differences. The results were evaluated according to which of the 41 symbols is comprehensible by healthcare users, with a median estimate of 87 per cent or more.

With this in mind, this thesis acknowledges that using abstract or geometric symbols on a local food map can make it difficult for users to understand because they may not clearly identify with the information the symbols represent. This can be incredibly challenging for specific age groups. Although pictorial symbols are assumed to facilitate interpretation of the meaning of symbols, a comprehension test seems beneficial to understand how local food map users interpret the symbols. Therefore, a usability test was conducted towards the end of this study to assess the usability of the local food map interface elements and to determine how users interpret the meanings of the symbols based on their choices. In the usability test aimed at revealing the comprehensibility of the symbols, participants from different age groups were shown a set of symbols designed during the visualisation workshop. They were asked to select one symbol for each question. By recording the total number of users who selected a symbol, by age group, the usability testing results assessed users' choices for symbols according to design principles. Thus, the usability test carried out for this thesis embarked on a

user-centred approach to local food map symbol design to help make local food maps accessible and user-friendly for everyone.

Line symbol: A flat surface phenomenon is highlighted by a line, which is only measured in terms of length (Fig. 2.9). For example, a railway and national border can be represented by line symbols (Darkes & Spence, 2017: 45) so lines can be used for drawing a border and showing a route. Further, lines can differ in colour to distinguish between a boundary and a river or in shape to distinguish between railways and roadways (Kraak & Brown, 2001: 60). Lines work with variables effectively in cartography, so it is an easy way to differentiate the information on maps.

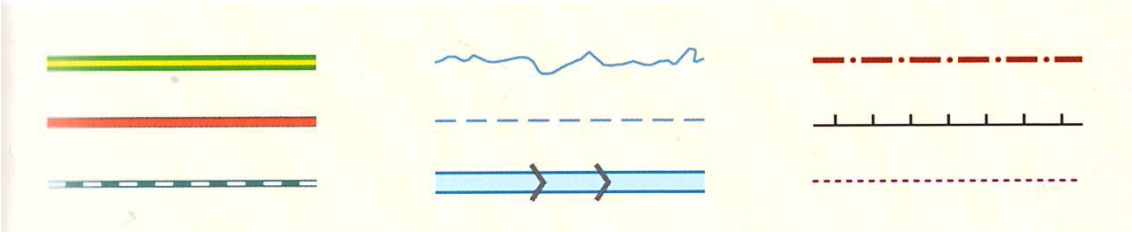


Figure 2.9 Examples of line symbols showing different variable use, adapted from Darkes & Spence (2017).

Area symbol: An area identifies a measured size and places a mark on a particular region (Bertin, 2010) (Fig. 2.10). An area may be shaped geometrically, abstractly, or symbolically (Pettersson, 2002: 120). Similar to line symbols, area symbols can use colour differences to denote different vegetation stands (Kraak & Brown, 2001: 60). Area symbols, like line symbols, use variables to differentiate the features on maps.

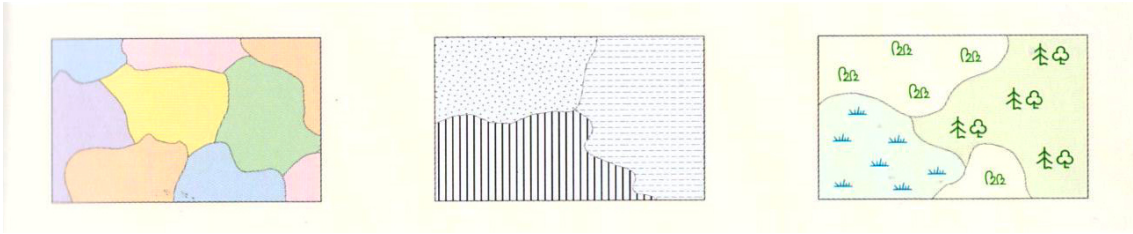


Figure 2.10 Examples of area symbols showing different variable use, adapted from Darkes & Spence (2017). The first box (left) shows the colour variable, the second (middle) shows texture use and the last (right) shows symbols used as pattern.

Further, the standard forms of symbols (point, line and area) can inform the map user about the data type (Tyner, 2015: 26), as symbols encode quantitative and qualitative (descriptive) information. Qualitative symbols show a location of an airport or a church (e.g., qualitative/nominal point symbols in nominal and ordinal columns in Figure 2.11 below), a road or a boundary (e.g., qualitative line symbols in the nominal or ordinal columns) and a children's park and adult's park (e.g., qualitative area symbols in nominal column in Figure 2.11 below). However, quantitative symbols in the form of point, line and area inform the map reader/user about the quantity (see quantitative information columns – interval and proportional – and point, line and area rows in Figure 2.11 below). Therefore, these examples show that the data type allows the use of graphical variables, which can differentiate the quantity in symbol design.

To summarise, symbols are used to show landmarks, borders/routes and areas on maps. Regarding the designer's choice, point symbols can be pictorial/mimetic and geometric/abstract. Using a pictorial/mimetic symbol that depends on the designer's choice *and* the user's ability is likely to communicate more effectively and, therefore, will increase usability. Further, in the context of effective communication, symbols work with variables and labels that differ in colour, borderline, background shape/colour, size, etc. Leading on from this, the following section thoroughly explains how to use graphical variables with symbols on maps.

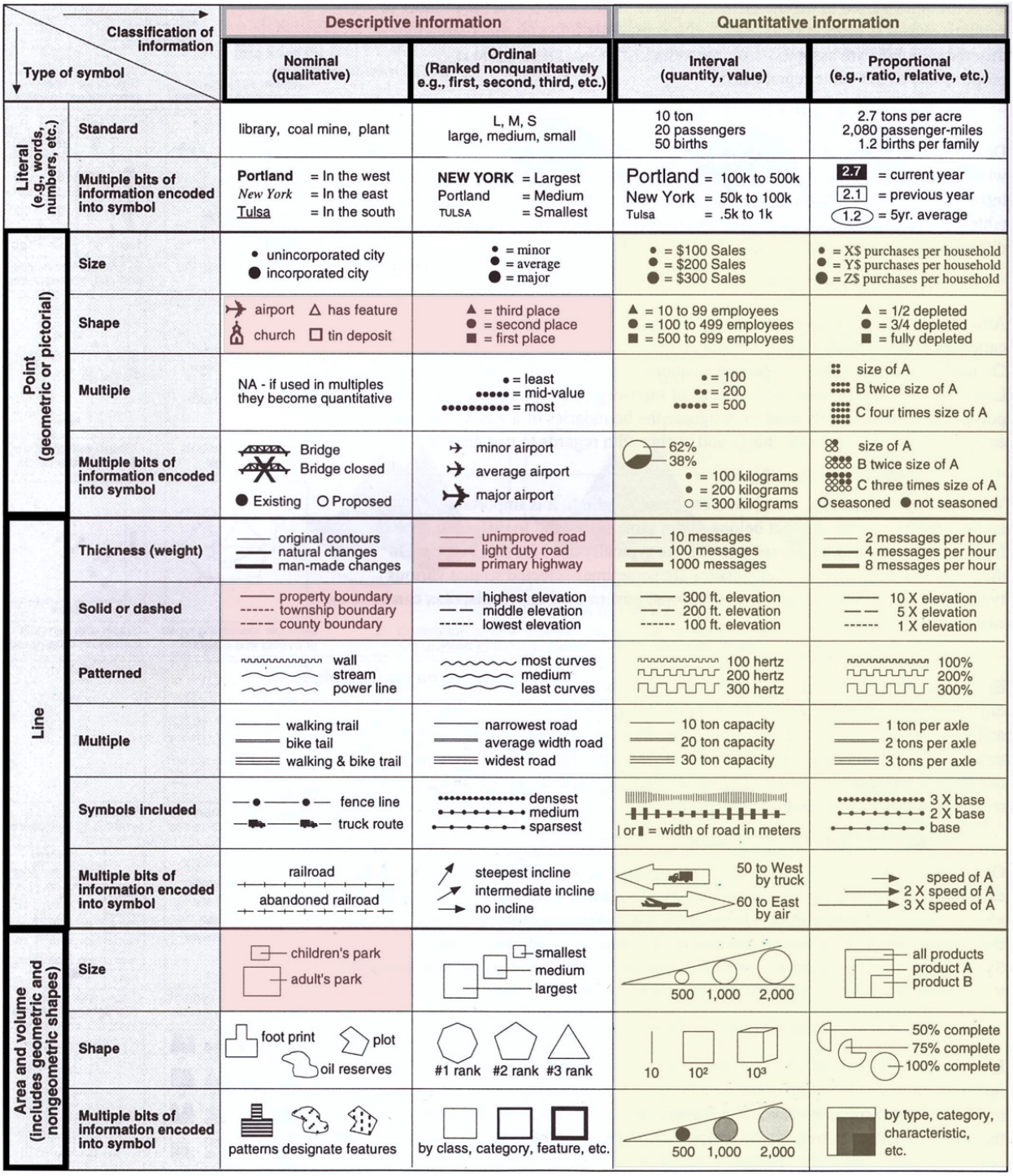


Figure 2.11 Examples of different types of symbols showing how to visualise descriptive and quantitative information – coloured by the author, adapted from Harris (1998).

2.4.2.2 Variables

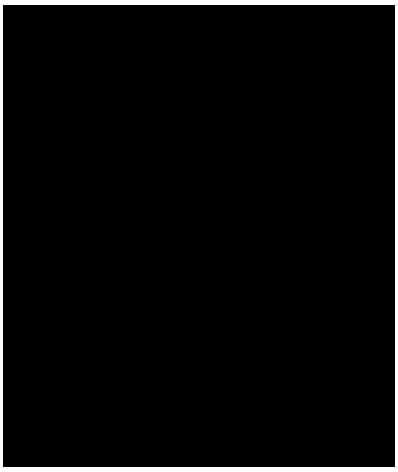


Figure 2.12 Diagram of Bertin's visual variables: size, colour value, texture, colour hue, orientation and shape, adapted from Bertin (2010).

Symbols are used with graphic variables to visualise qualitative and quantitative information on maps. Bertin, the French cartographer, establishes several graphic characteristics influencing pictorial language in symbol design (Twyman, 1985). Bertin's characterisation bridges cartography and information visualisation and explains how variables work perceptually (Bertin, 2010; Roth et al., 2017). Study and experience of employing graphical variables and their associated semiotic features today assists cartographers in selecting those that elicit a visual reaction and semiotic linkage in the users (Ipatow & Harvey, 2019). Semiotics is the study of how one thing gets to stand in for another (Roth, 2017). Perceptual reality is regulated by object constancy, which integrates our prior knowledge of the topic with the senses of sight, sound, smell, etc. (Pettersson, 2002: 137). Depending on the semiotic and perceptual context, Bertin proposes six graphical variables: size, value, texture, colour, orientation and shape (Bertin, 2010; and see Fig. 2.12). Following Bertin's approach, scholars have extended the variables to include size, value, hue, saturation, arrangement, texture, orientation, shape, focus, etc. (Ipatow & Harvey, 2019).

Further, Bertin distinguished graphical variables as associative, selective, ordered and quantitative, depending on their perceptual and semiotic formation (Bertin, 2010; Ipatow & Harvey, 2019; Roth et al., 2017) (Fig. 2.13 below). Information designers and cartographers employ graphical variables, such as size, colour value and texture, as significant graphical elements by applying similar information visualisation techniques. This method aims to send the intended message to the receiver easily and make the graphics more interpretable by the users, which makes communication effective. The following gives an example of how these variables might be employed.

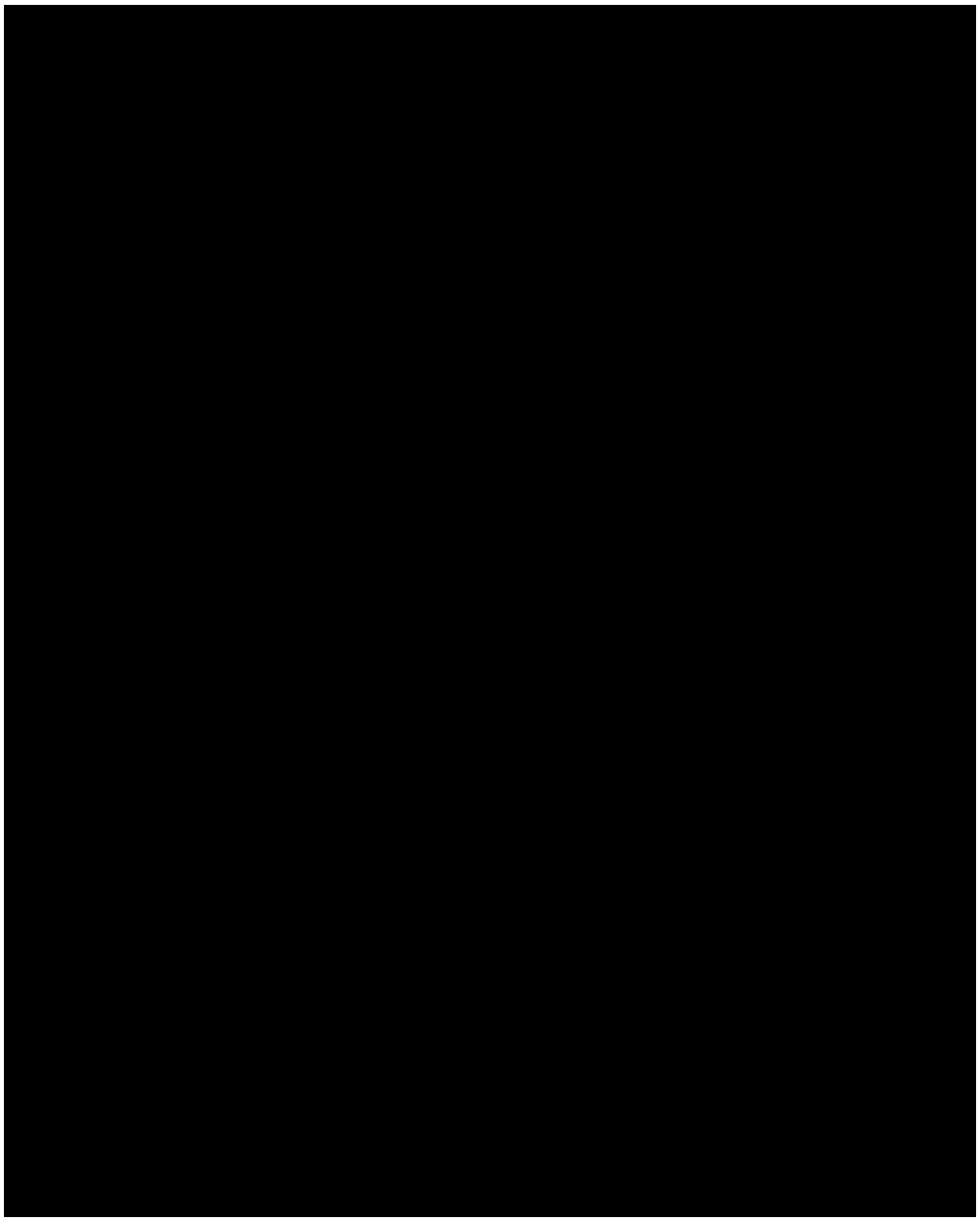


Figure 2.13 Diagram of Bertin's visual variables categorised according to their association, selection, order and quantity properties, adapted from Bertin (2010).

(1) *Location* is utilised as a graphical variable to depict the spatial in cartography by denoting the position of the map symbol (Roth, 2017).
(2) *Size* basically refers to how much space the map icon takes up (Roth, 2017). For instance, if a symbol takes up more space on a map, the user can interpret it as closer or more important than others. Pettersson (2002: 122) stresses that the ability to convey the intended message should be considered while determining the size of the graphic. In perceptual considerations, size can become selective if it takes up more space; it can represent quantity when

used with a line symbol; is dissociative when combined with any other variable and can be dominated by the other variable (Bertin, 2010). The information design literature highlights that other parameters in design that affect the perception of size are perceived distance, scale and contrast (Pettersson, 2002: 122).
(3) *Texture* refers to how rough the fill pattern of the map symbol is (Roth, 2017). Texture causes items to look 'smooth or rough, soft or hard, heavy or light, cold or warm, and sharp or flat' (Pettersson, 2002: 133). It may also have other associations – for instance, a textured symbol can be interpreted as more important than a non-textured one.
(4) With *shape*, users tend to associate the meaning of the same shapes with the same message because the same shapes are associative. Conversely, the intended message can become selective in different shape choices.
5) *Colour*, another graphical element, is essential to information design with its component's hue, value and saturation (Pettersson, 2002: 124). Colour is also a critical variable in cartography since it (a) clarifies meaning, (b) draws attention, and (c) leads to the users' perceptions (Tyner, 2018: 445). Choropleth maps are good examples of colour use in cartography as they can show a hierarchy using various colour sequences (Fig. 2.14 below).

Further, variable choice can also affect the symbols' work efficiency depending on the data type. MacEachren (1994: 33) claimed that 'resolution, location, size, transparency, crispness, colour value, and colour saturation' variables work well with ordinal data; 'colour hue, texture, and orientation' variables were 'marginally effective', and 'arrangement and shape' variables work poorly in an ordinal scale. Size, for instance, is the amount of space on the map used by the symbol and can be easily integrated into ordinal data (MacEachren, 1994; Roth et al., 2017).

Information designers can also use 'an array of conventional strategies for creating hierarchy' (Kostelnick, 2017: 269) that might be beneficial in map design when working on the legibility of a map's interface. In this way, map readers can perceive information in the 'right' order and interpret the primary/key information placed in the foreground, not only to create a hierarchy between the information, but also to address a broad audience by preserving legibility and simplicity.

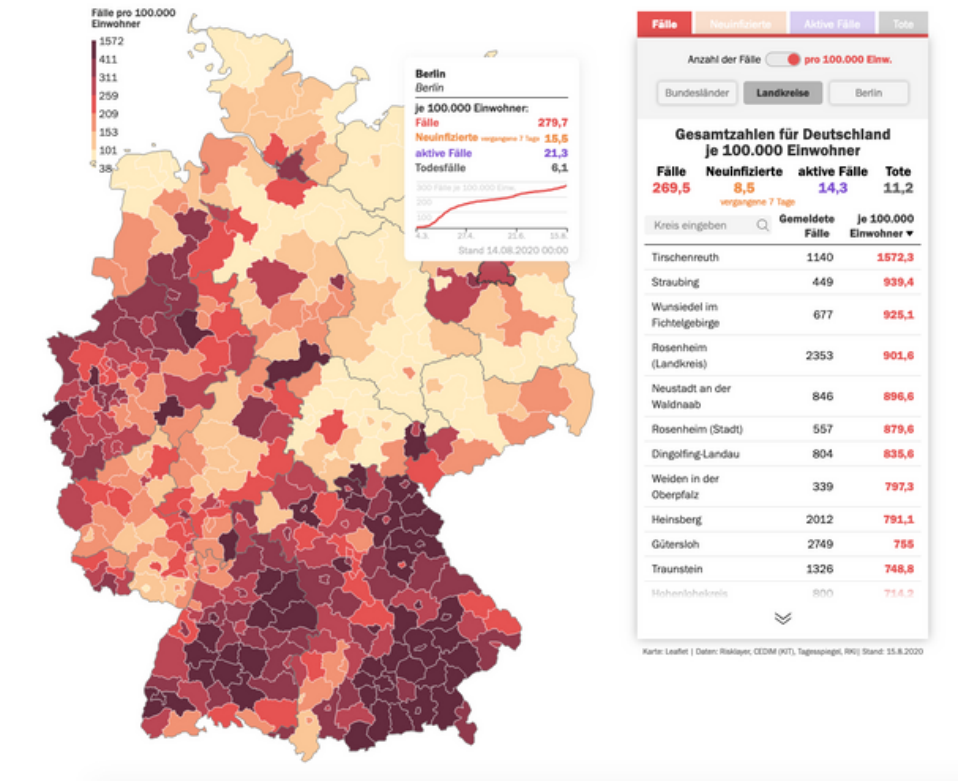


Figure 2.14 Choropleth map showing Coronavirus cases per 100K population, with six shades encoding quantities ranging from light to dark, adapted from Tagesspiegel (n.d.)

Therefore, this organisation level – working with variables according to their characteristics – makes the variables a higher-level source of information and is essential in the choice of representation (Bertin, 2010). That is because, accurately used, the perceptual and semiotic properties that come with variables can enhance the legibility of maps. However, Pettersson (2002) emphasises that it is hard to standardise how people react to colour stimuli in the context of colour use. The difficulty of standardising variables is relevant to all graphical variable uses when targeting effective communication. This is because the designer's intention and the user's accurate interpretation are unpredictable in different variable use. Another issue to be considered in the same context is labels that work with variables on maps. The following section discusses labels, which is the final focus of the interface design research of this thesis.

2.4.2.3 Labels

> *Words on a map mean what they say but also mean what they show* (Krygier and Wood, 2011).

Maps, as mixed media, employ both words and symbols (Tversky, 2017). Typography and symbols on maps are strongly intertwined (Kraak & Brown, 2001, 101). Labelling is the process of describing, naming, or categorising an item or feature (Wesson, 2018). The use of labels on maps encounters the issues of layout, scale and presentation, as well as symbol design. The labelling's style, form, weight, size and placement carry different meanings and provide the user with additional information (Wesson, 2018). Labels that participate in maps become a graphical element in the composition and work with other surrounding components.

In the context of this research, text, in the form of labels, is handled as a component of symbols or as a symbol itself. Text is generally used on the map interface for geographical names, symbols, or a small amount of descriptive information (Kraak & Brown, 2001: 101). The main concerns about accurate text use concentrate in legibility and functionality issues (Moys, 2017). In parallel to this, information design adheres to the ideals of clarity, functionality, and simplicity (Moys, 2017). Legibility of text in maps can be affected by two components: (1) the publishing environment, such as printed and digital genres and (2) the consistency of the map interface. Pettersson (2002: 165) claims that the typeface issue in desktop and printed publishing have something in common: (1) standard fonts are simpler to read, and (2) serif typefaces are frequently thought to be more straightforward to read.

Maps use serif and sans serif fonts (type styles) depending on their efficiency for readability. The concerns about the legibility of typefaces in digital map design are similar to those in web design. According to Darkes & Spence (2017: 23), 'Helvetica, Arial, Verdana, Geneva, Century Gothic and Trebuchet' are the most popular typefaces on web maps. Pettersson (2002: 168) claims 'Avant Garde, Futura, Gill, Helvetica, Optima, Univers and Venus' are the most preferred sans serif typefaces for words in figures.

Further, designers emphasise some properties of the type that may be varied: typeface, type style, type characteristics, type size, character spacing, and figure–ground relation (Darkes & Spence, 2017: 56). Some scholars in cartography, describing the text as a symbol itself, assess text properties within variables (Kraak & Brown, 2001: 101; Tyner, 2018: 446). That is because texts are affected by size, shape, orientation, value, and arrangement, which can all be used to enhance communication.

Figure 2.15 Example of labels using different variables while classifying information, adapted from Wesson (2018).

Text acts as a symbol when creating a hierarchy of feature classes in presented information, and size, case, spacing, or colour is used to create a hierarchy (Fig. 2.15). Type on maps is often used in smaller sizes, from 6 to 12 points (Darkes & Spence, 2017: 57). However, a larger text size can be employed to make certain information stand out. Likewise, a piece of important information can be given using bold text (type characteristics), as well as using capital letters and different character spacing (type characteristics). As a result, although labels require a much larger hierarchical order of information when designing a map interface, their appropriate use can support that hierarchy.

The legibility of the text is also affected by the figure–ground relation. There are two possible ways to ensure good readability in this context: (1) using an outline to the text, and (2) cast shadow (Kraak & Brown, 2001: 102). Alongside contrast and colour, other appropriate variables can be adapted to the text to increase its readability.

To conclude, this research, which focuses on interface elements of a prospective local food map, investigates how the design of information about local food can contribute to effective communication in maps. In doing so, it places interface design, particularly symbols, variables and labels, at the centre of the design practice in the further stages.

2.5 Conclusion

This chapter first reviews local food definitions and the relationship between farmers' markets and local food, setting the context of the thesis. It then proposes that effective communication in graphics-related cartography is only possible by understanding map users' needs and tailoring the design strategy with the methods and principles suggested by information design. In this regard, it draws attention to how information designers' decisions on symbol design would affect the communication between map makers and map users when designing map interfaces. When considering today's map users, it is possible to think of maps as digital design material in the user interface context. In this vein, a mixed approach is employed in this research that may assist professionals and non-experts with the usability of maps. The next chapter expands the thesis structure proposed in this chapter and focuses on methods applied in the design process that can increase the usability of the local food map.

3 Research methods

This chapter discusses the multidisciplinary methods and techniques used in this thesis to investigate how people who buy and sell local food can contribute to local food map design. The research procedure in this thesis involves the following methods:

- Examination of **government documents** to comprehend the definition of rural–urban areas in the UK and the rural densities of the research area: Berkshire, Hampshire and Oxfordshire

- Application of **visual communication and visual thinking method** to examine the demographics of the users in the three counties and exploration of the research area using current data visualisation methods in cartography

- Carrying out **an observation stage and a survey** to find out about local food map users and their interest in local food

- Developing **personas** based on the responses to the survey to make the target user group's characteristics more obvious

- Developing **user scenarios** to determine what tasks will be conducted in the visualisation workshop and usability testing

- Organisation of **a visualisation workshop** to explore the visual representation of information about local food that users want to find out about on local food maps

- Conducting **a usability test** with the visualisation workshop outcomes to determine whether they help people find information on local food maps

Ethical approval was obtained from the Department of Typography and Graphic Communication, University of Reading for the survey, visualisation workshop and usability testing.

3.1 The examination of rural areas in Berkshire, Hampshire and Oxfordshire

When analysing a region's socioeconomic characteristics related to local food purchasing and selling, it is necessary to distinguish between rural and urban areas. This research explores the emerging definition of rural areas to determine a geographic area where the interest in local food can be examined.

Government documents were used for their reliability and validity to gain an understanding of rurality in the UK. In the United Kingdom, the Rural–Urban Classification defines the differences between rural and urban areas (Bibby and Brindley, 2013). Additionally, the Rural–Urban Local Authority Classification is employed when data at a small enough geographical scale is unavailable (Defra, 2005). Adhering to the two classifications, the geographic area in this research was chosen as Berkshire, Hampshire and Oxfordshire, as the three counties include all the rural categories classified under the Rural–Urban Local Authority Classification (See Sections 4.1 and 4.2 in Chapter 4 for the detailed justification of the geographic area). The research of the government documents regarding rural–urban areas in the UK supports the notion that studying a broader geographic area with a wider range of rural districts enables a better understanding of the users of local food maps and their relationship with local food.

The following stage of this thesis adopts the visual communication and visual thinking model to examine the demographics of the local food map users in the three counties as an initial stage of user research.

3.2 The visual communication and visual thinking model as a user research method

This thesis embraces the visual communication and visual thinking model to obtain further information on the characteristics of target users of local food maps in the selected geographic area.

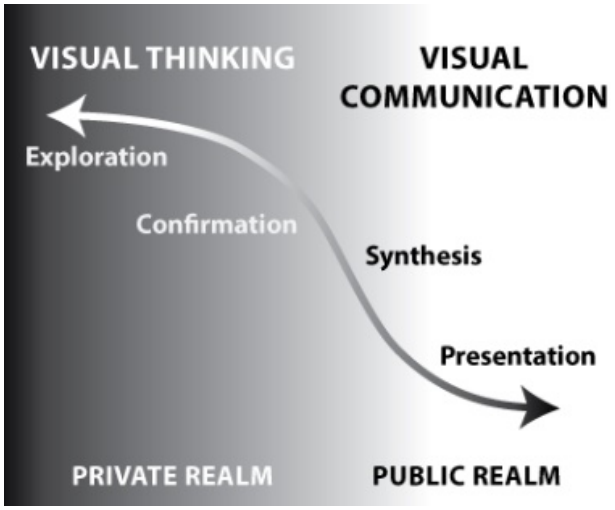


Figure 3.1 David DiBiase's visual thinking and visual communication model, adapted from MacEachren (1994), copyright American Association of Geographers (http:www.aag.org)

The visualisation (mapping) exercises carried out benefit from the use of this model to make the data about the demographics of the local food map users in the three counties clearly visible on maps.

This research handles digital maps in the context of communication design research and highlights their communicative role, helping people learn easily from well-designed information about local food on maps. In this regard, it is beneficial to consider David DiBiase's visual communication and visual thinking model, which encompasses a wide range of acts from exploratory data collection to data presentation in order to improve communication between map makers and users (Fig. 3.1). The exploration stage of the visual thinking model helps researchers to make assumptions early on (DiBiase, 1990, as cited in MacEachren, 1994: 2). In this research, the exploration stage is adopted to ask basic but appropriate questions to provide insight into target users (see Section 4.3 for the questions that point to initial assumptions).

Confirmation, the second phase of the visual communication and visual thinking model, focuses on mapping studies with the initial assumptions generated in the exploration stage and reveals anomalies in the assumptions with the help of maps and graphics (DiBiase, 1990, as cited in MacEachren, 1994). In the confirmation stage, the presumptions from the exploration stage are confirmed

or disproved. MacEachren (1994) claims that choropleth maps are useful tools enabling the relevant data to be visualised over a geographical area. In this regard, the two secondary data sets – age distribution data and income level data from Census 2011 – are analysed with choropleth maps (See Section 4.3.1 for the detailed visual investigation of the research area using choropleth maps).

In summary, this review strengthens the idea that research in the three counties will provide an opportunity to understand the general aspects of local food map users. Therefore, this study, which has initially researched critical user-related data within the mapping methods using choropleth maps, continues the next stage of its user research by employing the methods suggested by the information design. Based on user research methods, this study employs four steps: observation, survey, personas, and user scenarios. This involves the local food stakeholders in this research and provides insight into the needs of food map users. Thus, the following sections focus on the user research methods applied.

3.3 User research steps for designing a local food map

Users are the most crucial source of data for identifying needs, potentials and constraints, as well as for directing the creation of a design solution (Frascara, 2015). Diverse techniques may be needed to carry out the data collection phase of a project (Frascara, 2015). The user research deployed in both information design and the early stage of user-centred design appears to be an efficient method that enables an understanding of who users are and their functional necessities. According to Norman (2013: 9), a thorough understanding of people's needs and how the design is supposed to address them is the first stage in human-centred design. By applying user research, specific problems can be defined, and feedback can be directly obtained from users (Dyson, 2017: 437). In this regard, the ultimate purpose of user research applied from the early stages of UCD is to get the optimal design that addresses users' needs and provides the best user experience in design.

The user research methods applied in step (b) in the design process adopted in this thesis (see Section 2.3.1., Figure 2.3 for the thesis structure) identify the needs of local food map users and consider local people's participation in finding locally produced food, based on the first stage of the research. These steps follow each other and build upon one another in the design process to determine the design needs. The user research steps inform the initial stage of the design process in which the designer understands local food map users' needs before starting the visualisation stage. This is so that communication can be effective, which depends heavily on user adaptation (Frascara, 2015). Thus, the following sections address user research steps in this study that would significantly impact both the success of user interface design and specific design needs in map use.

3.3.1 Observations as a prior stage of the survey

The observations in this thesis are employed as one of the practical ways of determining who the stakeholders of local food are. Local food stakeholder investigation focuses on farmers' markets, where almost a third of the UK population purchases and sells local food (Harvey, 2008: 252) to determine who buys and sells local food. The observation stage was employed to determine what consumers buy, how vendors sell their products and how locals communicate with each other. Another advantage of the observations is that they informed the questionnaire survey in the next stage (See Section 5.1 for more details on the observation stage).

A thorough understanding of people's needs and how the design is supposed to address them is primarily possible with observation (Norman, 2013: 9). Frascara (2015) maintains that the methods used in anthropology are beneficial for visual communication design, particularly in terms of user observation. This research initially carries out an observation stage to understand local food map users and their needs. Consumers across the country visit farmers' markets regularly to buy fresh produce from stallholders and interact with one another. At this research stage, several informal visits to FMs and farm shops were carried out to observe locals' communication and shopping habits for buying local food

in their local environment. The observations were conducted in May 2019 at Reading FM, Hampshire FM, East Oxford Farmers' & Community Market, and Tolhurst Organic VegShed.

The observations support previous research into the definition of local food, which is aggregated into consumers' concerns about local food (see Section 2.1 for more details on the discussion on the definition of local food). Moreover, the observation stage helps understanding of the buying/selling habits of local food at FMs. However, there might be other possible findings because of the limited time of observations at this stage. For this reason, the next step of this thesis employs a questionnaire survey of the locals who engage with local food at FMs on the border of the three counties. The following section explains how the survey was conducted.

3.3.2 The questionnaire survey at farmers' markets

Beyond user observations, there are many user research methods available to involve users in design research and practice at different levels of the design cycle. Such user research methods are applied to involve users at varying levels and stages of the design process, such as surveys, interviews, focus groups, ethnographic observations, statistics and performance testing (Frascara, 2015). The questionnaire is one of the most popular methods UX designers choose to involve users in research. The questionnaire was chosen as an appropriate method for this research because of its relevance to user involvement and its ability to include the target users (consumers and vendors at FMs). Besides, the user-centred design also focuses on users' preferences and needs as a part of qualitative research (van Elzakker and Ooms, 2018). In this regard, the questionnaire is particularly useful in studying 'who users are, what users want, what they purchase, where they shop, what they own' (Gary, 2013). Thus, a structured series of written questions informed by the observation stage reaches large numbers of locals at farmers' markets and provides quantitative data (further details on the survey can be found in Section 5.2). In this way, locals' characteristics, preferences, attitudes and habits are revealed

through the surveys, and these inquiries help uncover user needs and keep the users at the centre of the design cycle.

Considering the examination of the government documents regarding rural–urban areas in the UK and the application of the visual communication and visual thinking model, the questionnaire was deployed within the borders of three counties – Berkshire, Hampshire and Oxfordshire. The survey was conducted at Windsor, Banbury, Hampshire, Reading, Caversham, East Oxford, Newbury, and Deddington Farmers' Markets between 1 June 2019 and 7 July 2019. Separate questionnaire versions were prepared for consumers and vendors (see **Appendices 1.A and 1.B** for the consumer and vendor surveys).

The consumer survey identifies the importance of farmers' markets in finding local food and what other factors need to be considered to find out about local food when designing a local food map (see Chapter 5 for more details on the user needs for local food maps). Further, the consumer survey reveals whether FMs are consumers' regular shopping places and whether FMs meet the consumers' expectations. This stage exposes the relationship between consumers' visits and the high quality of products, reasonable prices, buying local food, supporting local businesses and shared values between consumers and vendors. The questionnaire also identifies consumers' interest in local food shopping online and understands their interest in a prospective online local food map that would allow them to find out about products. The vendor survey investigates what is sold, how and by whom and how local food reaches consumers. The questions about the selling methods also support the questions about the selling places, which is critical to determine whether the food is local. In addition, the vendors describe their customers demographically, including which products they tend to buy and what they talk to each other about.

As a result, the survey defines the current local food buyers' and sellers' habits in buying/selling local food and determines what they wish to accomplish by using a local food map. These stages inform me, as a designer, how a prospective local food map can meet the map users' needs; they present a summative evaluation and help to provide the best user experience by better

understanding user needs. The insights gained from the survey are utilised in the following stage to develop realistic personas that reflect local people's needs.

3.3.3 Developing personas

One of the most important advantages of creating personas in the design cycle is that it allows for representing a real person's needs. Grudin and Pruitt (2002) state that although personas are fictional, they have names, ages, clothes, occupations, families, friends, pets and socioeconomic status. Even though personas are fictional characters, it is necessary to have accurate data to create them. This thesis employs the development of personas to provide the best user experience by understanding users' needs, expectations, behaviours and attitudes. In this vein, this research builds the personas' stories using the user data collected at FMs, and thus the features of the personas describe real people's (locals') needs and goals at FMs.

The two vendor and two consumer personas are developed to reflect the target user group's needs (see Section 5.4 for the persona development). The FM survey mainly specifies the personas' age range, behaviours, actions, needs and frustration points so that the developed personas directly contribute to the following research stage. In the next step of the thesis, the personas are positioned as the starting point for developing the user scenarios that account more for peoples' daily practices regarding finding out about locally produced food, and also assist in determining the functionality of a prospective local food map.

3.3.4 Creating user scenarios

This research develops four user scenarios and summarises the user cases deriving from previous research steps by focusing on the characteristics of the personas (see Section 5.5 for more details on the user scenario development). User scenarios tell stories that explain how and why users must interact with the system (Interaction Design Foundation, 2016a). Through the user scenarios, this thesis aims to promote empathy, understanding and a user-oriented approach to local food maps. It specifies the

users' needs for local food maps and emphasises what should be transferred to the design practice. The same scenarios are used in two stages of the design cycle – the visualisation workshop with design practitioners and usability testing with the target user group. The specific points derived from the user scenarios determine the questions asked of the design practitioners in the visualisation workshop. In the last stage, the usability test also employs the same scenarios to evaluate the usability of the interface elements designed by the practitioners. Thus, the user scenarios used in this research determine the design strategy and posit how users' needs can be transferred to a map environment.

As a result, in this thesis, user research steps are positioned at the centre of both design research and practice. User research elucidates who local food map users are and what their ages, needs, interests and wishes are in detail and determines the content of the local food map. The content is then organised by following user research stages; the most critical needs are posited with the user scenarios and moved to the visualisation workshop, where graphic design research is conducted with information design practitioners. Therefore, this thesis, which examines the graphic language of the prospective local food map to communicate with its users effectively, continues with the visualisation stage to design according to user needs.

3.4 Visualisation workshop with information designers

In this stage of this user-driven research, the information design practitioners are involved in creating interface elements of a local food map with an online visualisation workshop to investigate the users' needs (see Chapter 6 for the visualisation workshop). Interfaces that are well-designed are almost invisible to the user (Interaction Design Foundation, 2016b). The users can easily achieve the tasks intuitively with less effort. In such cases, user satisfaction is expressed with the product's success. In this regard, the workshop includes information designers in the design development so user needs in terms of local food maps are taken into consideration, and the effectiveness of the local food map interface is increased. Thus, the design practice in this research

seeks to improve the user experience by considering design criteria from the perspective of information design practitioners.

The visualisation workshop focuses on the interface of the local food map and explores the following questions:

> (1) In the context of simplicity and clarity, how can a local food map interface be designed to present information effectively by avoiding unnecessary symbols and labels for effective communication?
>
> (2) What should the symbolic language of a local food map that would answer the users' needs be? Pictorial/mimetic or geometric/abstract?
>
> (3) How are local food map symbols designed evocatively if standard symbols cannot be found?
>
> (4) In the context of unity and consistency, how can related items be linked and unrelated items disassociated to achieve visual organisation of symbols on a local food map?
>
> (5) How can graphical variables, such as colours, textures, and type attributes, the visual identity carriers, be used to provide information and interpret the connection between information on digital maps?
>
> (6) To increase legibility and readability, how can typefaces (using font style, form, size, space and colour) that become essential for symbols and labels be used?
>
> (7) To increase legibility and readability, how can graphic elements such as colour, contrast and texture be considered in digital map interfaces to direct attention toward or redirect attention away from information/messages?

It is important to note that the time allocated for each task is limited for the participants during the workshop (See **Appendix 3.B** for the task durations). The visualisation workshop tasks investigated the questions above and were prepared according to the survey outcomes. The investigation points emerged as (1) how

to design symbols related to local food that users are looking for on the map (such as the local food shop symbol or the farm symbol); (2) how to display detailed information about the product that consumers want to buy (such as distribution and sales options); (3) how to visualise information such as distance and proximity in a way that enables accurate inference of quantitative information by using variables (such as inferring 'close' by visual design without measuring distance); (4) how the communication between a consumer and a seller in real life (such as telephone, email) will be provided on the map interface with a visualisation method. In this regard, design practitioners design the interface elements – symbols, variables and labels – to be simple and straightforward by avoiding ambiguity and facilitating the interpretation of their meanings. Thus, the UI elements of the local food map can communicate easily with its users; users can feel more comfortable and interpret the symbolised things accurately and easily. In order to develop a complete picture of a well-designed local food map, in the next step, the visualisation workshop outcomes are employed to develop a prototype to be trialled in the usability test.

3.5 Usability testing

This research includes developing a prototype tested in the final stage of a local food map interface design. The user tasks at this stage are prepared based on the user scenarios that reflect the users' needs collected with the survey, parallel to the tasks used in the visualisation workshop. Through prototype development, a usability test is employed in the last stage of the design cycle as a form of user research (see Chapter 7 for the usability testing). The usability testing aims to reveal users' responses to different visual representation methods and how easily and accurately they can engage with the designed interface solutions in the context of their experience of local food maps.

The usability test collects locals' insights in order to explore the best ways to present information about local food on digital maps. That is because the effectiveness of the communication that establishes a common space for the designer of the information and its interpreter is significantly influenced by how well it can

adapt to the user (Frascara, 2015). In this regard, understanding the needs and concerns of the stakeholders is critical to effective communication (Linksy, 2017: 635). According to Linksy (2017: 635), information design that refers to clear communication is built on 'the three pillars of LUNA; Locate, Understand and Act'. In this three-pillar structure,

> *Stakeholders must be able to locate information easily and quickly. Then they need to understand the information they have found. And, finally, once the information is found and understood, the stakeholder must be able to act on the information* (Linksy, 2017: 635).

The methodological approaches of information design construct these three pillars with an iterative process, including 'usability testing, ongoing reviews, more testing, and updating' (Linksy, 2017: 635). In this research, the product/prototype is put into the formative evaluation to understand how local food stakeholders can interact with the information easily with the aim of usability. In this regard, through the map prototype, this research carries out the usability test to gather feedback from users and evaluate the design according to user reactions.

The online usability test is conducted with locals in Berkshire, Hampshire and Oxfordshire to evaluate local food map interface elements designed in the online visualisation workshop in the previous research stage. The usability test determines whether the interface elements of a local food map make information comprehensible and meet consumer and vendor-led needs.

3.6 Conclusion

This research acknowledges that the best user experience is only possible by understanding map users' needs and carrying out the design practice by addressing those needs and user feedback. In order to achieve this, this thesis completes the data collection stage with the three main research steps:

(1) Collecting local food map users' needs with the survey

(2) Addressing the users' needs with designers in the visualisation workshop

(3) Usability testing with the local food stakeholders

The study also reviews government documents in the context of user research and learns about the research area and local food map users. The user research steps are extended through the development of personas and user scenarios. By applying these methods, this thesis investigates the usability of the local food map interface elements and how easily and accurately local food map users can interact with the map interface. The next chapter describes the first method used in this investigation, the examination of government documents to define the rural–urban areas in the UK and determination of the geographic area for this research.

4 Geographic framework

Geographical proximity is essential in addressing the issues of locally produced food and spatial matters on maps. In the context of locally produced food, the term 'geographical proximity' mainly relates to elements such as regional producers, especially small farms, as well as distance and food miles. Rural areas in the UK are placed at the forefront of research regarding geographical proximity, specifically their proximity to local food retail places and a consideration of distance, footprint, and the stages of growing, producing, and marketing. Because of the prominence of rural areas, selecting an appropriate geographic area and considering its characteristics is necessary. Thus, this chapter reviews the key aspects of rural areas in the UK, selects an appropriate geographic area and visually examines the selected area with choropleth maps.

4.1 Understanding the definition of rural areas in the UK

This thesis employs rural–urban areas defined by government documents to determine the research area geographically. The definitions used in this section are drawn from the 2011 Rural-Urban Classification (RUC2011) and The Local Authority Districts Level Classification.

The 2011 Rural–Urban Classification (RUC2011) characterises rural and urban areas in the United Kingdom (Bibby and Brindley, 2013). This characterisation consists of three levels: 'Output area (OA), super output area (SOA), and ward level' (Bibby and Brindley, 2013). According to this classification, each output area is divided, whether it is 'a physical settlement with a population of 10,000 or more' (Bibby and Brindley, 2013). The smaller population of smaller towns is considered rural (Bibby and Brindley, 2013). Data on OAs from the 2001 and 2011 censuses provide the lowest geographical scale, which is classified into 'one of six rural or four urban' subcategories (*Defra rural*

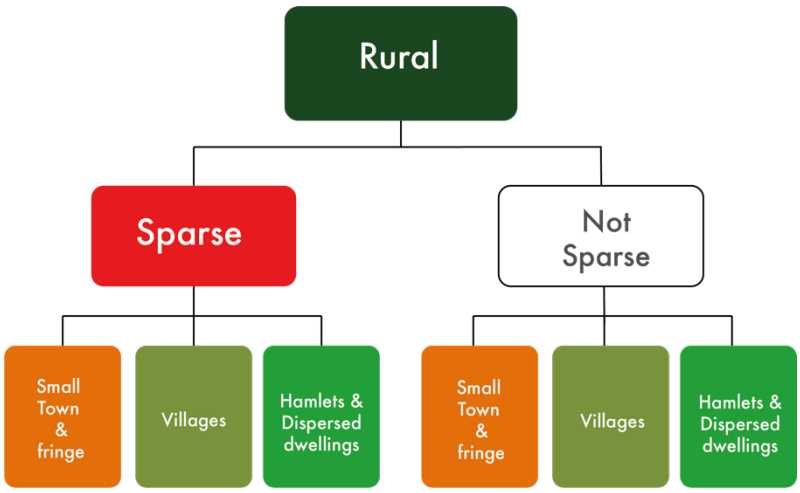


Figure 4.1 Diagram showing the lowest geographical scale for the rural categorisation, classified into six rural subcategories based on Output Areas; redrawn from *Defining rural areas* (Defra Rural Statistics, 2017).

Statistics, 2017; and see Fig. 4.1). Further, the diagram showing six rural categories in Figure 4.1 indicates a division by sparse and not sparse areas. The term 'sparse' defines the larger areas which are sparsely inhabited and where individual dwellings may be remote (Defra Rural Statistics, 2017). Despite providing data on 'the population and morphology', the OAs do not offer data on land use (Bibby and Brindley, 2013).

Adhering to the above categorisations, the Local Authority Districts Level Classification is applied for categorising rurality in the UK. It classifies rural areas as 'Major Urban (76 LADs), Large Urban (45), Other Urban (55), Significant Rural (53), Rural 50 (52), and Rural 80 (73)' (Defra, 2005; and see Fig. 4.2 below). The numbers in Figure 4.2 show how many Local Authority Districts are in each group. The hierarchy in this classification is determined by population density. For instance, Rural 80 denotes more than 80 per cent of people living in rural areas, whereas Rural 50 indicates 50 per cent to 80 per cent (Defra, 2005). Likewise, Major Urban LADs describes urbanised regions with 'at least 100,000 people, or 50 per cent of the population' (Defra, 2005).

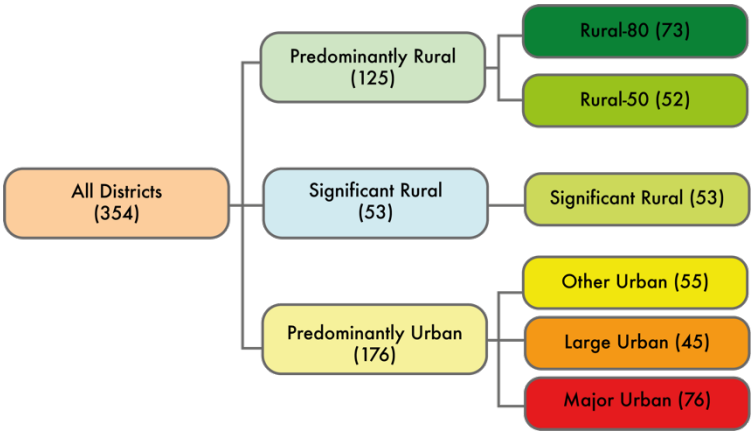


Figure 4.2 Diagram showing the structure of the Rural Classification, redrawn from *Defra Classification of Local Authority Districts and Unitary Authorities in England* (*Defra,* 2005).

The documentation mentioned above identifies an analytical framework that grows around the theme of rural areas. Several parameters can be adopted, depending on the research objective, to determine whether a region is rural. Resident density in rural territories is one of the critical parameters to define rurality in the UK. Therefore, this thesis examines rural areas according to the 'Rural 80, Rural 50, Significant Rural, Other Urban, Large Urban, and Major Urban' division, and dependent on the residents living in rural areas as classified by the Local Authority Districts Level Classification (Defra, 2005). Hence, the following section discusses the three counties —Berkshire, Hampshire and Oxfordshire— based on the extent of rural areas.

4.2 Rural classification in the counties of Berkshire, Hampshire, and Oxfordshire

This thesis initially focuses on investigating the obtainability of Berkshire's local food by examining the classifications of rural–urban areas above for practical reasons. Extensive research by the Local Government Commission for England has shown that Berkshire encompasses six unitary authorities: West Berkshire, Reading, Wokingham, Bracknell Forest, Windsor and Maidenhead and Slough (*Encyclopaedia Britannica*, 2023a). However, regarding the Rural–Urban Local Authority District Classification, only West Berkshire, within the border of

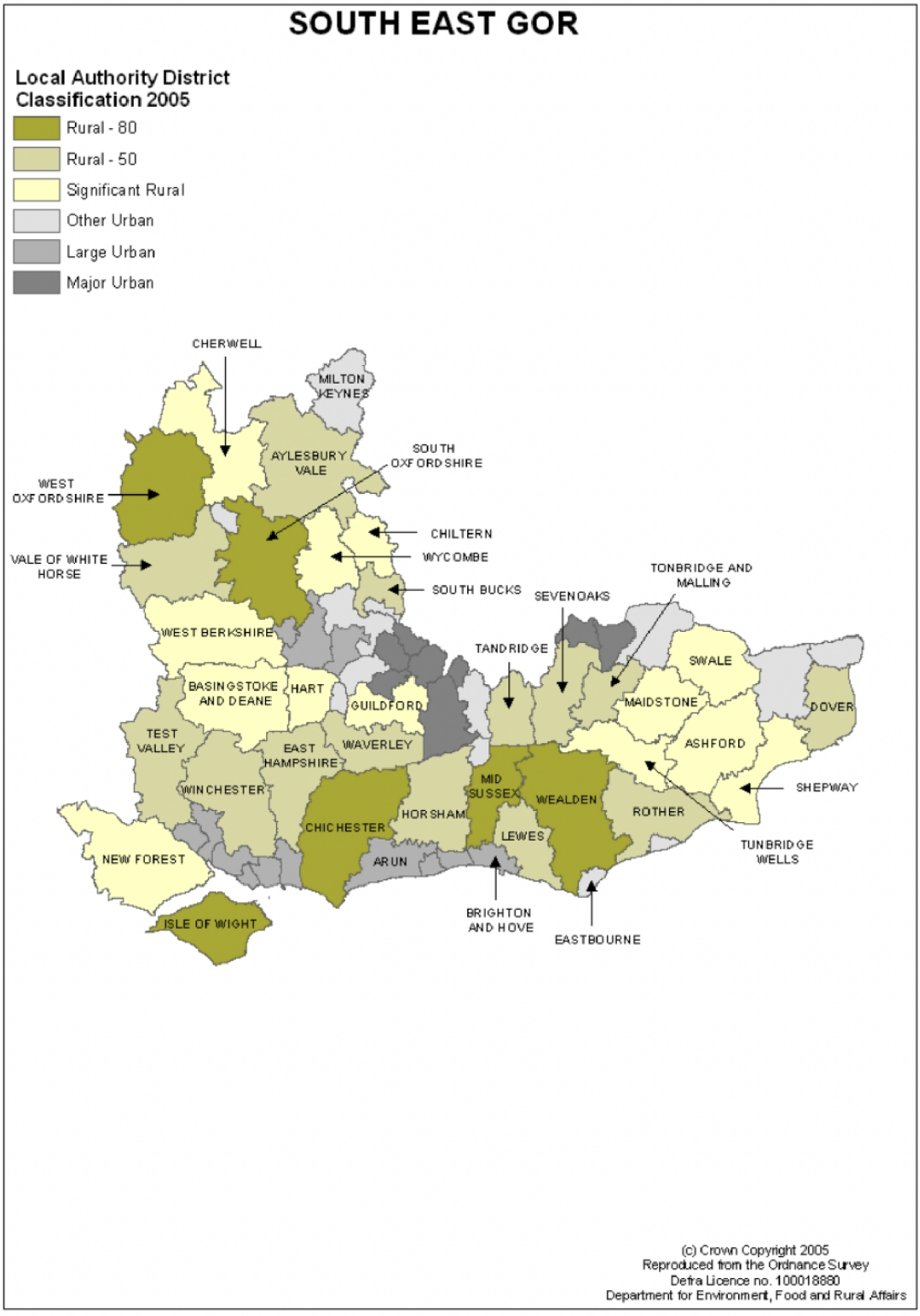


Figure 4.3 Map showing the South East region, including the named rural districts of the three counties, adapted from Department for Environment, Food & Rural Affairs (2011).

Berkshire, qualifies as Significant Rural (see Fig. 4.3 above and Table 4.1 below).

Reading and Wokingham and Bracknell Forest are classified as *Large Urban*, and Windsor and Maidenhead and Slough are *Other Urban* (see Fig. 4.3 above and Table 4.1 below). After examining the rural characteristics of Berkshire, Hampshire and Oxfordshire are included in the research to examine the issue of local food in a broader range of rural density.

Hampshire has two levels of local government: Hampshire County Council and eleven district, borough, and city councils (Encyclopaedia Britannica, 2023b). Hampshire is divided into 'administrative, geographic and historic' counties (Encyclopaedia Britannica, 2023b). The administrative county of Hampshire includes 'East Hampshire, Hart, New Forest, Test Valley, the boroughs of Basingstoke and Deane, Eastleigh, Fareham, Gosport, Havant, and Rushmoor, and the city of Winchester' (Encyclopaedia Britannica, 2023b). The geographic county includes the entirety of the administrative county as well as the cities of Portsmouth and Southampton, which are the unitary authority (Encyclopaedia Britannica, 2023b). The historic county encompasses the geographic county, the unitary authorities of Bournemouth, and the Isle of Wight, as well as 'the borough of Christchurch and parts of the district of East Dorset' (Encyclopaedia Britannica, 2023b). Of these, Test Valley, Winchester, and East Hampshire are named Rural 50, and Basingstoke and Deane, New Forest and Hart are classified as Significant Rural (see Fig. 4.3 above and Table 4.1 below). Other administrative counties of Hampshire are categorised as a Large Urban Area or Other Urban Area (see Fig. 4.3 above and Table 4.1 below).

Oxfordshire comprises five local authority districts: South Oxfordshire, West Oxfordshire, Cherwell, the city of Oxford and Vale of White Horse (Encyclopaedia Britannica, 2023c). Of these, South Oxfordshire and West Oxfordshire are recognised as Rural 80 (see Fig. 4.3 above and Table 4.1 below). Cherwell is classified as Significant Rural, Vale of White Horse as Rural 50, and Oxford as Other Urban (see Fig. 4.3 above and Table 4.1 below).

Table 4.1 The named rural districts of the three counties in the South East region, drawn by the author.

Berkshire	
Bracknell Forest	Large Urban
Reading	Large Urban
Slough	Other Urban
West Berkshire	Significant Rural
Windsor and Maidenhead	Other Urban
Wokingham	Large Urban
Hampshire	
Basingstoke and Dean District Council	Significant Rural
East Hampshire District Council	Rural 50
Eastleigh Borough Council	Large Urban
Fareham Borough Council	Large Urban
Gosport Borough Council	Large Urban
Hart District Council	Significant Rural
Havant Borough Council	Large Urban
New Forest District Council	Significant Rural
Portsmouth City Council	Large Urban
Rushmoor Borough Council	Other Urban
Southampton City Council	Large Urban
Test Valley Borough Council	Rural 50
Winchester City Council	Rural 50
Oxfordshire	
Oxford	Other Urban
West Oxfordshire	Rural 50
South Oxfordshire	Rural 80
Vale of White Horse	Rural 50
Cherwell	Significant Rural

This section has attempted to provide a summary of the documentation relating to rural areas and justification of the research area according to the rurality in this part of the UK. To this end, three counties were selected as the research area — Berkshire, Hampshire and Oxfordshire — in order to be able to include all the rural categories: Significant Rural, Rural 80 and Rural 50 (Table 4.1). The following section reviews these areas

demographically to understand prospective local food map users using choropleth maps as a part of user research.

4.3 Understanding users demographically by applying mapping studies

This thesis uses choropleth maps to learn more about users who engage with local food in the selected geographic area and to make the relevant data visible on maps (see Section 3.2 for more details on the visual communication and visual thinking model). The literature on local food indicated that food consumption differs between rural and urban consumers in the UK and is affected by other factors, like social class and age (Kemp et al., 2010). It is also worth investigating whether there is an economic reason for local food purchase. To this end, in the exploration stage of the visual communication and visual thinking model, two questions are asked about the local food map users in the three counties: **'What is the age distribution across the three counties?'** and **'What is the income level distribution in the three counties?'** The primary assumption arising from the first question is that a significant proportion of specific age groups could reside primarily in rural areas of the three counties, and the second question examines the economic reasons for the relationship between affordability and local food interest. These inquiries about target users prompt an examination of age distribution and income level data. The age structure in local government data sets in England and Wales for the 45–64 and 65–84 age ranges (Office for National Statistics, 2011) and the income level data are examined (Office for National Statistics, 2019) in order to determine the answers to these questions. The following section defines choropleth maps and examines the population in the three counties by visualising the two data sets on choropleth maps.

4.3.1 Applying choropleth maps as a user research method

At this thesis stage, the population aged over 45 and gross disposable household income level are analysed to understand potential users demographically in the three counties using choropleth maps. The choropleth maps are defined as a standard

way of mapping data about areas and represent 'value by area' maps that convey statistics (Darkes & Spence, 2017: 76). Choropleth maps are classified as quantitative thematic maps in cartography (Tyner, 2015: 133) and show the data 'such as census enumeration districts, local authorities, wards and counties or countries' (Darkes & Spence, 2017: 76) (see Fig. 4.4 for an example). These maps arrange the data spatially to make it easy for the reader to observe patterns (Royal Geographical Society with IBG, 2022) by shading or colouring the value to be displayed (Tyner, 2015: 133). Through modern computerised methods, it is possible to create choropleth maps quickly and easily (Tyner, 2015: 133). Choropleth maps effectively use colour value, colour hue and colour saturation to extend the perceptible range of categories on the data. Colour value, for instance, is an essential term to be considered when applying value that has a finite scale from 0 per cent to 100 per cent (MacEachren, 1994). A range of hues and saturation ordered by value should be considered when creating (choropleth) maps. In this way, choropleth maps can convey accurate information to map users by visualising the data. Therefore, this research uses choropleth maps as a powerful tool to make the demographic data visible about local food map users in the three counties.

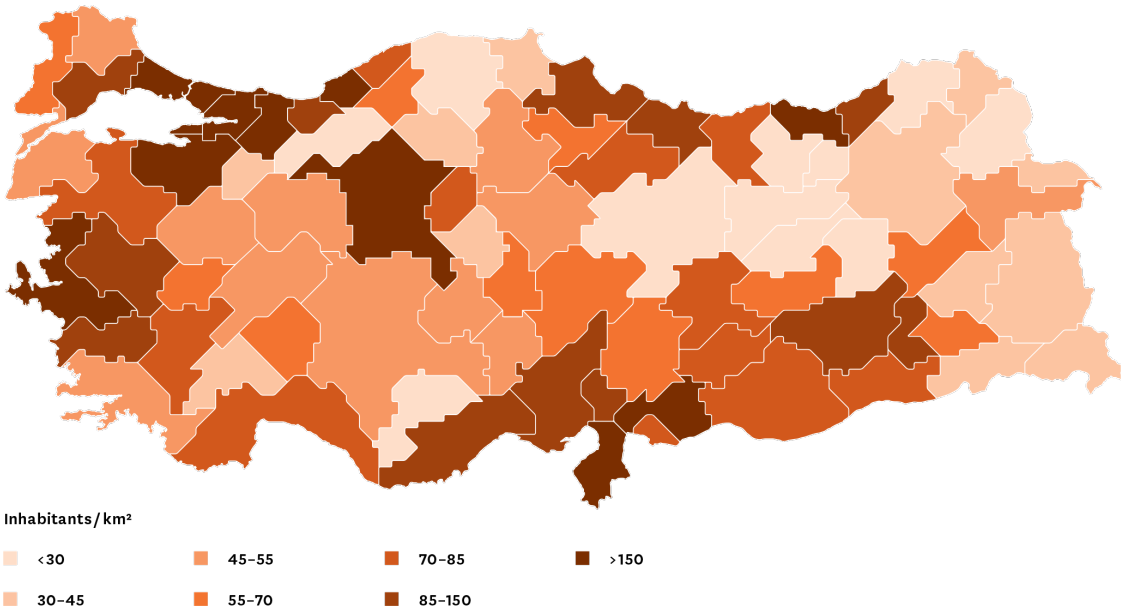


Figure 4.4 Example of choropleth map showing Türkiye's population density by province, adapted from Derviş and Öner (2009).

At this stage in the study, the two data sets are initially analysed for the three counties with column charts in Microsoft Excel software (Figs 4.5, 4.7 and 4.9 below). The districts in the charts are ordered according to the population size in those districts and the income level distribution. Next, the data shown in the charts are used to draw choropleth maps by assigning random single (hue) colour values with increasing opacity according to numbers (Figs 4.6, 4.8 and 4.10 below). Colour hue and colour saturation are adjusted to enhance the readability of the data on the choropleth maps. The data showing the districts of the three counties is depicted by dividing them with lines; the lines are not assigned values but are used to distinguish the districts.

The first set of analyses examines where people aged 65–84 live in the three counties, depending on the Local Authority Districts Level Classification (Figs 4.5 and 4.6 below). People of this age group (25,000 persons and above) prefer to live in coastal zones such as the New Forest and Southampton. What is striking is that more than 35,000 persons aged 65–84 prefer to live in the New Forest, classified as Significant Rural. Southampton, as the second most popular place for those aged 65–84, is Large Urban.

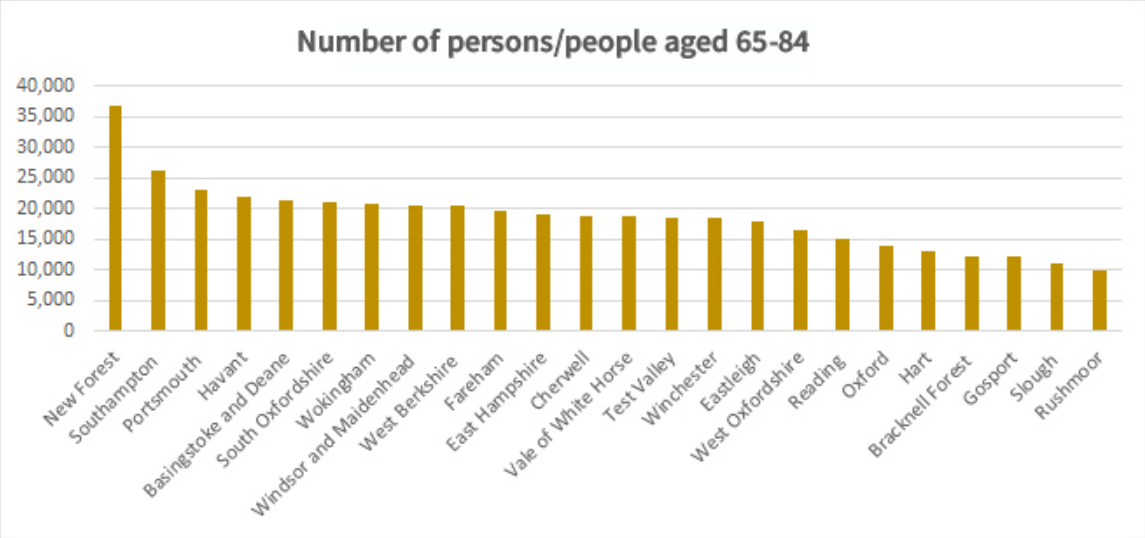


Figure 4.5 Column chart drawn by the author in Excel software using the data from the population aged 65–84 in Oxfordshire, Berkshire and Hampshire; data retrieved from Office for National Statistics (2011).

People over 65 years old (15,000 persons and below) least prefer to live in Reading, Oxford, Hart, Bracknell Forest, Gosport, Slough and Rushmoor, all classified as Large/Other Urban, excluding Hart, which is classified as Significant Rural.

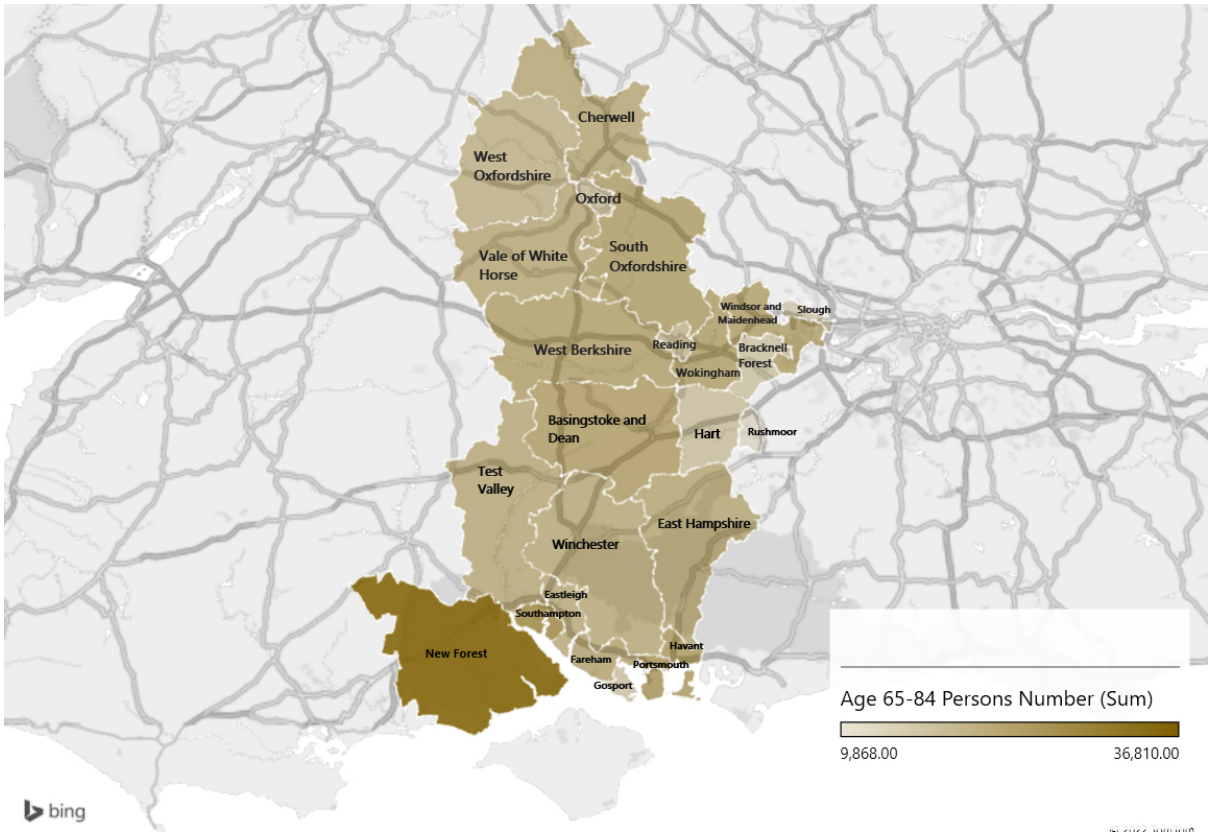


Figure 4.6 Choropleth map drawn by the author in Excel software using the data from the population aged 65–84 in Oxfordshire, Berkshire and Hampshire; data retrieved from Office for National Statistics (2011).

This result may initially support the hypothesis that a specific age group is higher in some rural areas as people aged 65–84 prefer rural areas, primarily the New Forest (over 35,000, Significant Rural). However, it is unlikely that this hypothesis is correct as Southampton and Portsmouth, classified as Large Urban, are the second and third most favoured for people aged 65–84 and are urban.

Furthermore, the present results illustrate that the size of the population aged 45–64 (40,000 persons and above) is also higher

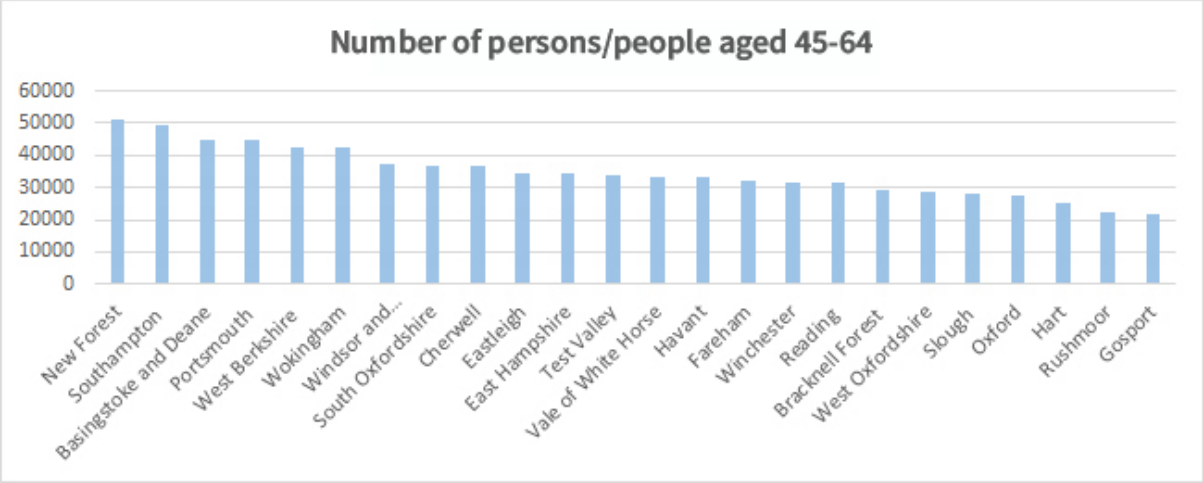


Figure 4.7 Column chart drawn by the author in Excel Software using the data from the population aged 45–64 in Oxfordshire, Berkshire and Hampshire; data retrieved from Office for National Statistics (2011).

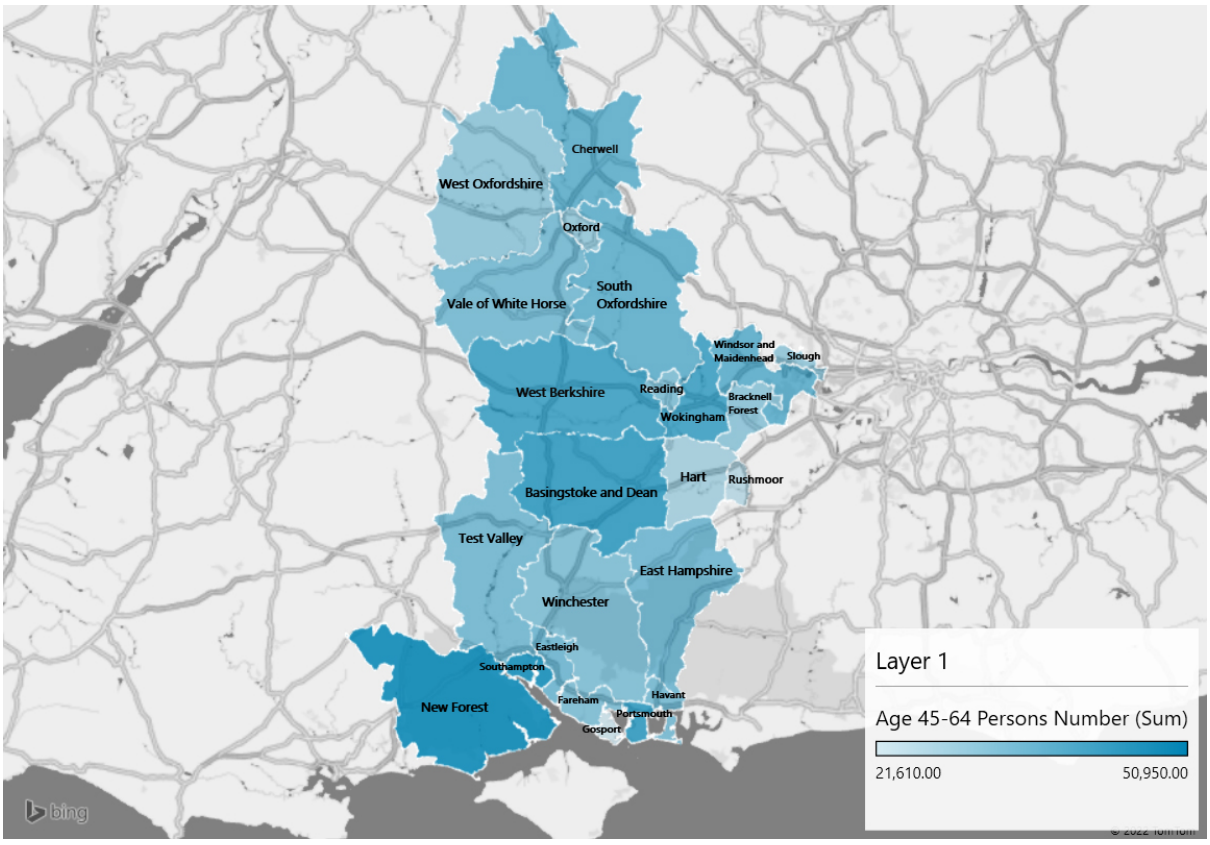


Figure 4.8 Choropleth map drawn by the author in Excel software using the data from the population aged 45–64 in Oxfordshire, Berkshire and Hampshire; data retrieved from Office for National Statistics (2011).

in the New Forest and Southampton (Figs 4.7 and 4.8 above). In addition, clusters of people aged 45–64 are concentrated around Basingstoke and Deane, Portsmouth, West Berkshire and Wokingham, classified as Significant Rural, Large Urban, Significant Rural and Large Urban, respectively. Surprisingly, people aged 45–64 (30,000 persons and below) also least prefer to live in Oxford, Hart, Bracknell Forest, Gosport, Slough and Rushmoor, which are classified as Large/Other Urban. Hart is also one of the least preferred areas, classified as Significant Rural. Aside from these Large/Other Urban areas, people aged 45–64 do not obviously tend to live in West Oxfordshire, which is classified as Rural 80. Therefore, there is no visible pattern suggesting that certain age groups living in rural areas in the three counties.

Further, the choropleth map using the income level data shows a slight difference in Oxford and Winchester (Figs 4.9 and 4.10 below). Both districts have the highest gross disposable household income per head in the three counties, at £25,000 and above. However, East Hampshire, Windsor and Maidenhead, Test Valley, Reading, Wokingham, Bracknell Forest, Hart, Rushmoor, South Oxfordshire, New Forest, Cherwell, Vale of White Horse, West Berkshire, Slough, Basingstoke and Dean, Oxfordshire, Eastleigh and Fareham fall into the £20,000 and above category. These findings show slight differences in income level between most cities/boroughs/towns and Oxford and Winchester. While the highest gross disposable income level is present only in Oxford and Winchester, at the other end of the scale Southampton and Portsmouth are the only districts that fall below £15,000. It is unwise to assume that interest in local food is affected by economic means, as most of the towns/cities/boroughs have a population with a gross disposable household income of £20,000 and above in the three counties.

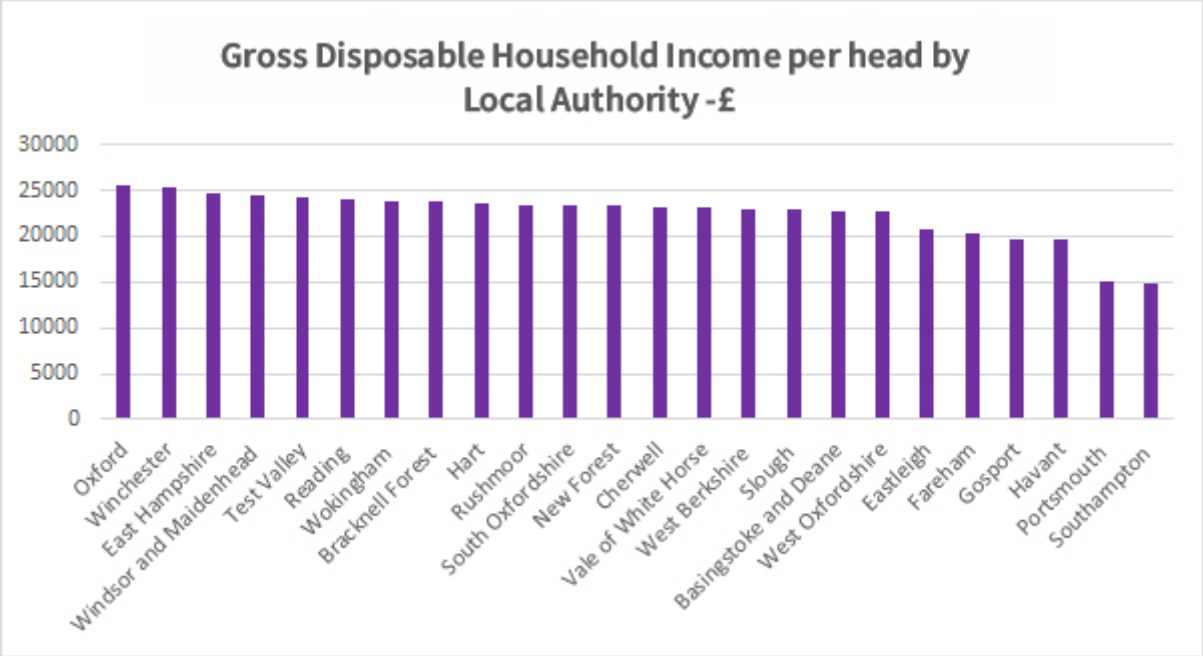


Figure 4.9 Column chart drawn by the author in Excel software using the 2016 data for the mean gross disposable household income (in GBP) per head in Local Authority Districts; data retrieved from Office for National Statistics (2019).

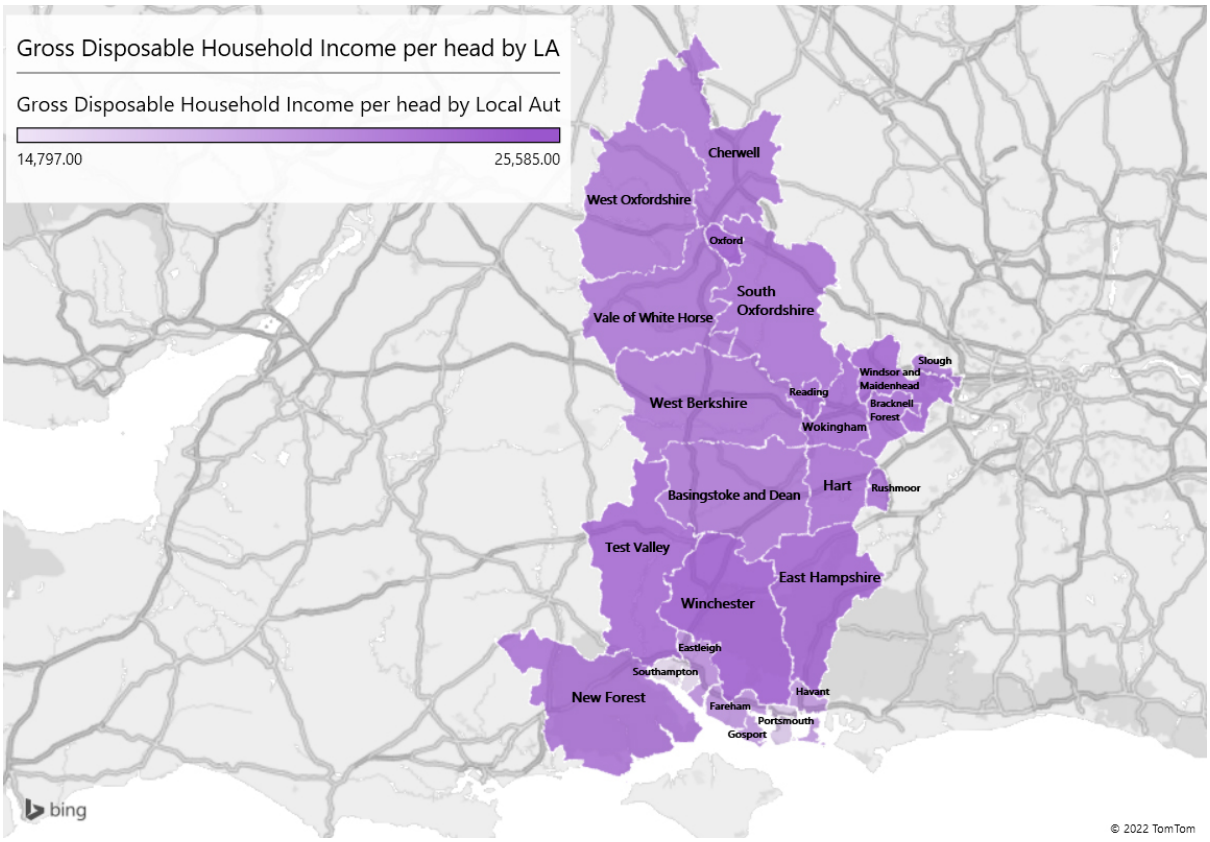


Figure 4.10 Choropleth map drawn by the author in Excel software showing the 2016 data for the mean gross disposable household income (in GBP) per head in Local Authority Districts; data retrieved from Office for National Statistics, (2019).

4.4 Conclusion

Turning to the choropleth map research results, no significant clusters in the two age groups' distribution and income level are evident in the rural areas of the three counties. However, the present results are significant in at least three major respects:

- There is no specific age group clustered mainly in rural areas, excluding New Forest (for ages 65–84) and Southampton (for ages 65–84 and 45–64), but both age groups are also distributed among the districts in towns/cities/boroughs of the three counties.

- There are more people aged 45–64 than 65–84 in the three counties.

- Interest in local food is unlikely to be affected by economic means, as most of the towns/cities/boroughs have a population with £20,000 and above gross disposable household income in the three counties.

This section has employed choropleth maps as initial user research by considering the visual communication and visual thinking model and has examined the demographic aspects of potential local food map users in three counties with specified rurality. The following stage continues with user research to reveal the needs of local food map users in the three counties.

5 Understanding user needs for local food maps

Information designers know that the success of their message relies on it being interpreted and responded to accurately by the recipients. For this reason, research on information design involves people (users), respects their knowledge and ability, and tailors the design practice considering their needs and use conditions. In this vein, maps – only graphic design-related cartography – are design materials that should keep the users' needs and use scenarios in mind. In the context of this research, the interpretation of the symbol showing a local food shop on the map, for instance, is not only about its graphical representation but also about users' needs, knowledge, ability, and experience. Hence, this thesis employs an observation stage and a questionnaire survey at farmers' markets and attempts to understand local food map users and their needs, habits, preferences and tendencies before proceeding to the design practice stage.

5.1 Observational assessment at farmers' markets

Farmers' markets are the most prevalent type of outlet in the local food system in the UK and can be characterised by their collaborative nature, functional relationship to a social context, and role as such. FMs are included in the observation stage of this thesis as the study involves two local food stakeholder groups, consumers and vendors. At this stage, the observations at FMs particularly help determine what consumers buy, how vendors sell their products and how locals communicate with each other. The observation stage includes two approaches: (1) a small informal chat with vendors and consumers and (2) monitoring the communication between consumers and vendors while buying/selling local food. In the first stage, the small informal chats were carried out with consumers and vendors while they bought or sold local food without disrupting their business, and the questions I asked both groups were rarely direct. In the second stage, I only monitored consumers and vendors while they were

shopping and selling, and I listened to their exchanges. After each visit, the small talks and observations were noted by me, and all the notes informed the questionnaire survey in the next stage.

The observation phase showed that consumers and vendors of all age groups in FMs were comfortable communicating with each other as members of the same community. Moreover, some consumers at Reading FM said that buying local food from FMs allows them to discuss where food comes from with vendors. Most consumers highlighted that if they could voice their matters in person, they might be able to reduce their anxiety about food not being local, fresh and healthy. The notes taken showed that talks between consumers and vendors primarily comprised a series of questions asked by consumers, like: 'Is this organic? / How about animal welfare? /Is it free-range? / How old is it? / Are they fresh? / Is it pasteurised? / How about distance (food miles)?' In addition to discussing product information, they exchanged new recipes or discussed their family news and the current agenda, like Brexit. The conversations showed that consumers and vendors easily find a discussion topic daily, emphasising the importance of social communication. Hence, participating in FMs on a regional basis for both stakeholder groups seems a practical solution to reduce consumers' anxiety about the localness and freshness of the food and to help them socialise in their own community.

On the other hand, vendors did not have much time to chat with consumers. At this point, the most significant support for vendors came from other family members, as they were chatting at the same time while selling. Most vegetable and fruit stalls worked with family members to run their businesses. In this way, they could find a chance to chat with their customers. According to one farmer whom I talked to while shopping for vegetables from his stall in the Hampshire FM, people's primary motivations for visiting these markets must be locality and healthiness. However, farmers' anxieties were mainly driven by sales and other issues affecting sales, such as drought and weather. In addition, some vendors mentioned the advantage of selling at FMs as producers/farmers. One of the farmers I spoke to mentioned that farmers' markets offer vendors many opportunities, such as periodic sales, earning money and creating their own customer

Figure 5.1 Picture showing locals shopping at the East Oxford Farmers' & Community Market; photo taken by the author.

Figure 5.2 Picture showing locals shopping at the East Oxford Farmers' & Community Market; photo taken by the author.

base. He emphasised that most of his friends, including himself, were small producers, so the lack of these opportunities would mean that they could not survive among the huge supermarket chains.

Further, it is noticeable that each market has its own sales strategies and collaboration methods. For example, East Oxford Farmers' & Community Market successfully reflects on its community spirit through local volunteers and producers (Figs 5.1 and 5.2 above) (See **Appendix 2** for more photos taken by me at the FMs visited). The East Oxford Farmers' & Community Market is operated by managers, local volunteers and producers. Visitors can easily observe the strong relationships in this team. The managers and producers know the production, marketing and other farming difficulties and work hard to find collaborative and local solutions. However, some markets, such as Hampshire FM and Reading FM, highlight relatively extensive organisational collaborations. This collaboration may be explained by the producers using the name of the FM as an umbrella to sell their products easily. However, the markets that feed into their local community spirit, like East Oxford Farmers' & Community Market, find their own solutions with the help of the local community.

The shopping habits in local communities also contribute to the trust among the people in the same community. With its VegShed, which is always open, Tolhurst Organic, an organic vegetable grower in the Thames Valley, emphasises this mutual trust. Tolhurst Organic sells its freshly-harvested products in a lovely wooden shed, allowing its customers to pay into an honesty box themselves. This shopping method financially and emotionally supports the local communities and protects the local countryside's spirit.

To conclude, this section reviews the key aspects of FMs using the observation stage before surveying FMs. A great deal of previous research into local food has shown that consumers' demand for high-quality food might be the primary driver to visit FMs (see Chapter 2 for more details on local food and farmers' markets). Similarly, the observation stage illustrated that consumers' questions are concentrated around food quality. Further, Moseley

(2003: 8) indicates that a local spot gives a sense of place and inspires participation. In the same vein, the observations point out that consumers and vendors are keen to discuss products they would buy and also the current agenda at FMs. Small talk between consumers and vendors is an essential part of their shopping at FMs and evokes positive feelings in them. Thus, the observations briefly summarised the interest of vendors and consumers in local food in their environment and the relationship between local food and locals. The following section expands this examination with a questionnaire at various FMs in Berkshire, Hampshire and Oxfordshire.

5.2 The questionnaire survey at farmers' markets

This research employs a questionnaire survey to gather the needs and concerns of consumers and vendors regarding buying and selling local food at farmers' markets. The survey helps gain insight into local food map users, their needs and online habits. While preparing the questionnaire, the concerns about the products raised by consumers obtained in the observation stage and their interest in detailed information about the products shaped the survey questions.

The questionnaire was conducted at FMs located in Berkshire, Hampshire and Oxfordshire (Fig. 5.3 below). Thirty-nine consumers and twenty-one vendors were recruited for the consumer and vendor surveys based on willingness to complete a ten-minute survey about purchasing local food at FMs (Fig. 5.3 below). The participants filled out an information sheet about the survey and signed a consent form before answering the questions (see **Appendices 5.A and 5.B)**. The participants' answers were written on the questionnaire forms by me. Additionally, interested participants were asked if they would provide their contact details as a first step in building a pool of potential users who might be interested in further research relating to the developing system (see **Appendix 5.C** for the consent form for contact information to participate in future studies). The thirteen participants who agreed to their involvement in the further research stage were invited to the remote online usability test.

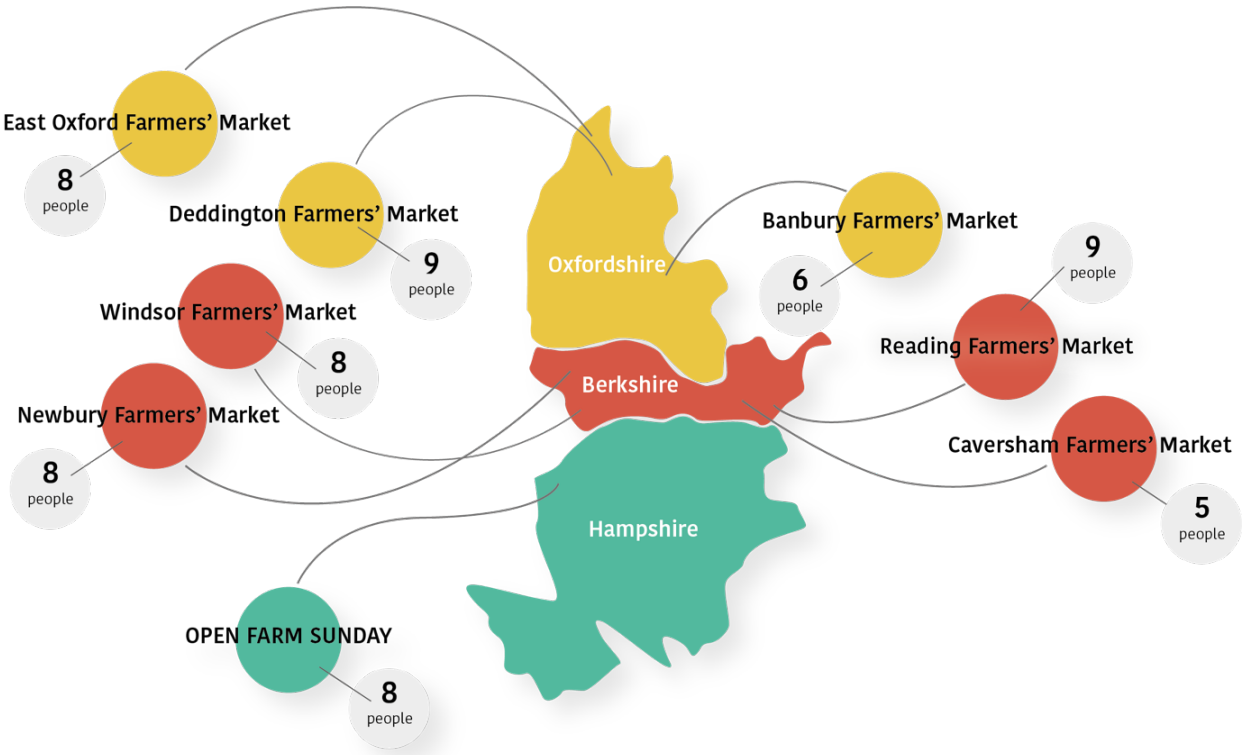


Figure 5.3 The three counties map showing how many participants were surveyed in each farmers' market; drawn by the author.

All the questions were initially grouped to make the questionnaire more understandable and accessible for the participants. The consumer questions were grouped under five headings: (1) the interests of consumers in farmers' markets, (2) general shopping habits of consumers, (3) travelling to the shopping places, (4) online habits of consumers, (5) the interest in a new web-based system (Table 5.1 below).

Table 5.1 Grouped consumer survey questions, including types of questions.

The interest of consumers in farmers' markets	
How often do you visit Farmers' Markets?	*multiple-choice question*
Is there any specific reason why you do not come more often?	*open-ended question*
Do any of the following factors have an influence on how frequently you visit?	*multiple-choice question*
Please tell me how important you think the following features are when visiting this farmers' market.	*ranking question*
Which products do you usually buy from Farmers' Markets?	*open-ended question*
About general shopping habits of consumers	
Where do you regularly shop other than Farmers' Markets?	*open-ended question*
Why do you shop at this/these (other) places?	*open-ended question*
About travelling to the shopping places	
Where do you live?	*open-ended question*
How do you travel to come here?	*open-ended question*
How long did it take to get here?	*open-ended question*
Online habits of consumers	
Do you shop online? Why...	*multiple-choice question & open-ended question*
Do you buy food online?	*multiple-choice question*
Do you buy local food online?	*multiple-choice question*
Do you use web sites or social media channels to find/find out about local food?	*multiple-choice question*
Why do you not use web sites or social media channels to find out about local food?	*open-ended question*
How did you find out first about this Farmers' Market?	*multiple-choice question*
If there was a general online service to find out about products and where they are grown/ sold, would you be interested?	*multiple-choice question & open-ended question*
Interest in new map-based system	
If there was a general online service for people selling from farms, would you be interested?	*multiple-choice question & open-ended question*

The design of the vendor questionnaire was based on the same approach as the consumer questionnaire. Criteria for grouping the vendor questions were as follows: (1) job description, (2) cooperation with farmers' markets, (3) selling methods, (4) online habits, (5) selling online, (6) interest in a new map-based system, and (7) information about customers (Table 5.2 below).

Table 5.2 Grouped vendor survey questions, including types of questions.

Job description	
How do you describe your job?	*multiple-choice question & open-ended question*
The cooperation with farmers' markets	
What are you selling at the Farmers' Markets?	*open-ended question*
Where is your place of production?	*open-ended question*
Why did you choose ---- Farmers' Market to sell your product?	*open-ended question*
Are you involved in other farmers' markets except this market?	*open-ended question*
Selling methods	
Do you sell your products around your place of production?	*multiple-choice question & open-ended question*
Do you do home delivery?	*multiple-choice question*
Online habits	
Do you have a website?	*multiple-choice question*
Does your website efficiently represent your job/products?	*multiple-choice question & open-ended question*
Do you use social media channels?	*multiple-choice question & open-ended question*
Selling online	
Do you sell online?	*multiple-choice question*
Which platforms do you use for selling online?	*multiple-choice question*
Which way of selling is more profitable?	*multiple-choice question*
What is the advantage or disadvantage of selling online?	*open-ended question*
Why do you not sell online?	*open-ended question*
Interest in new map-based system	
If there was a general online service for people selling from farms, would you be interested?	*multiple-choice question & open-ended question*
Information about the customers	
How do you describe your customers?	*multiple-choice question*
Why do people tend to buy farm products?	*multiple-choice question*
What do people (customers) usually ask you? For example; what did you talk about with one of your customers this morning?	*multiple-choice question*

Grouping questions under related headings made it easier to identify local food buyers and sellers, their online habits, their need for a local food map, and where/how they shop and sell, and made the relationship between the questions visible. The following section examines the participants' responses in detail to reflect users' needs for the local food map.

5.2.1 Research findings: consumer survey

The consumers were asked first about the frequency of their visits to the FMs (Fig. 5.4). Thirteen of the thirty-nine indicated 'once a month', and twelve 'once a fortnight'. Farmers' markets are usually held once a fortnight or once a month in England. This outcome showed that more than half of the consumers (25 participants) visited FMs once a month or once a fortnight.

Figure 5.4 The frequency of the consumers' visits to the farmers' markets.

The fact that twenty-three out of the thirty-nine customers who responded in the same way to the question about how they learned about the FMs' existence highlighted the importance of communication. Twenty-three answered this question as 'word of mouth'. Likewise, another eleven people indicated they learned about the FMs from the communities that they are a part of.

The following question revealed that a number of factors have a significant impact on consumer visits to the FMs (Fig. 5.5). Twenty-one participants out of thirty-nine indicate that the quality of products affects the frequency of their visits to the FMs. The other reasons given were the range of products (18 participants), accessibility of the market (16 participants), prices (10 participants), car parking (7 participants) and ease of access to other outlets (6 participants). The quality, variety, and the markets' accessibility thus seem to be the most crucial factors. Ten or fewer people noted the costs, parking and accessibility of other stores.

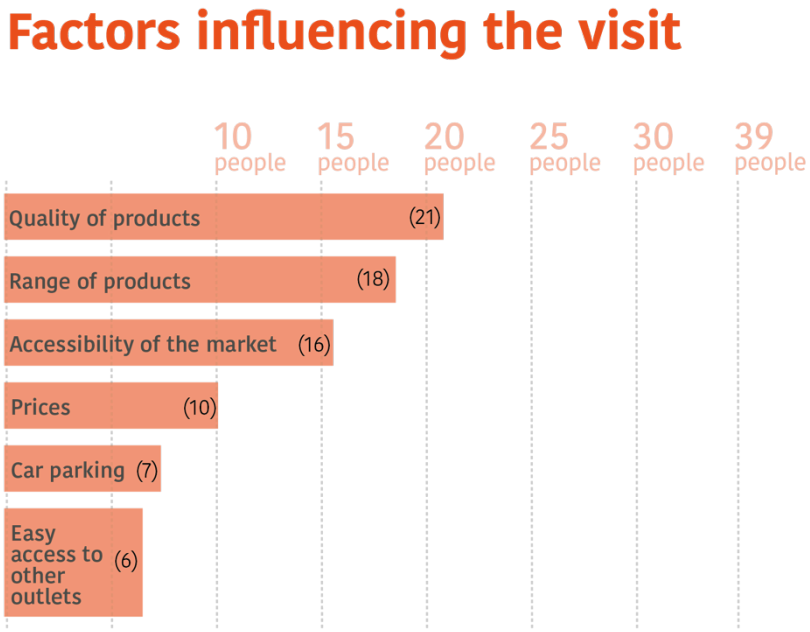


Figure 5.5 Summary of the consumers' reasons for the frequency of FM visits.

Further, a set of rating scale questions were asked to justify consumers' decisions to buy from FMs. Consumer reasons revealed specific points about product quality and sustaining local businesses (Table 5.3 below).

Table 5.3 The relative importance of reasons for shopping at farmers' markets.

Importance of the following features

	Number of persons/people		
The high quality of products	36	2	-
Supporting local business	36	2	-
Knowing more about what you're eating	33	3	2
Buying local food	34	4	-
Healthy eating/lifestyle	29	9	-
Ease of access	22	6	6
Shared values between consumers and vendors	22	13	2
Spending time with others who engage with local community	16	14	8
Reasonable prices	13	23	-
Ease of car parking	13	10	5
	Very	Some	Not

Almost all consumers chose high-quality products and supporting local businesses as very important (Table 5.3). Additionally, most participants stated that it is very important to know what they eat and thus buy local food. Twenty-nine consumers chose healthy eating/lifestyle as very important. Moreover, more than half of the consumers chose both the ease of access (22 participants) and shared values between consumers and vendors (22 participants) as very important. Spending time with community members was also chosen by sixteen participants as very important.

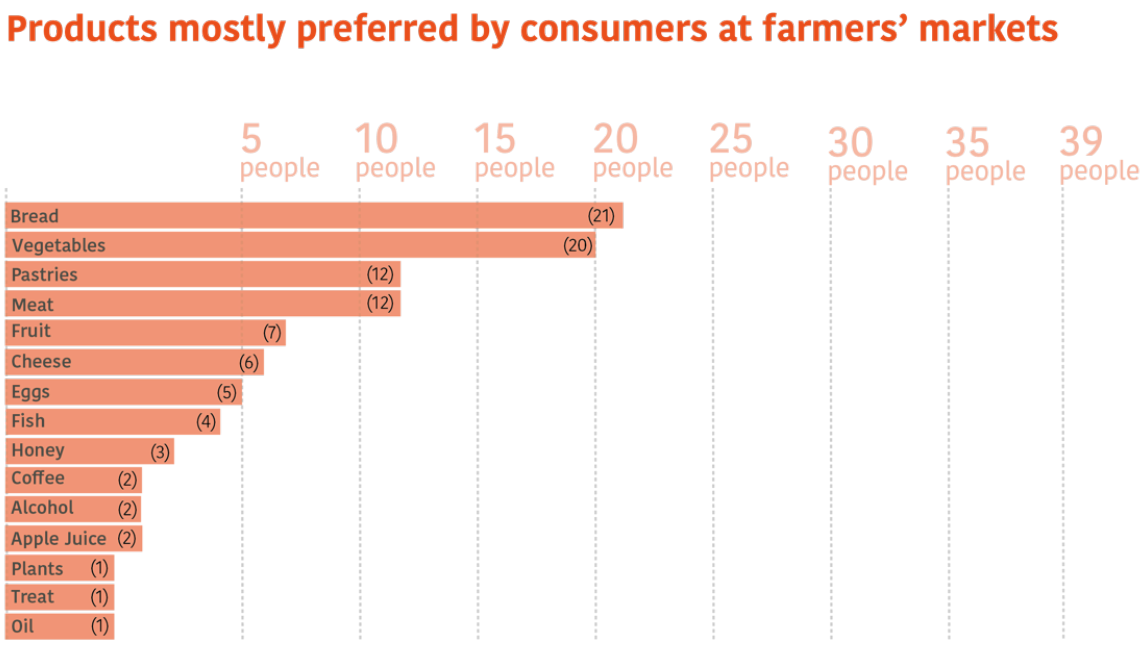


Figure 5.6 The products that consumers buy most from the farmers' markets

Further, bread, vegetables, pastries, meat and fruit are the preferred purchases by consumers at FMs (Fig. 5.6). The survey showed that twenty-one consumers visited the FMs to buy bread and twenty consumers out of thirty-nine buy vegetables from FMs.

A set of questions was asked in order to understand consumers' wider shopping habits. When asked where they regularly shopped, thirty-six consumers indicated supermarkets. Local shops were chosen by three consumers. Then, consumers were asked the reasons why they shopped at other retailers (Fig. 5.7 below). Convenience (21 participants) dominated as the main reason for choosing supermarkets. The other reasons given were: quality (13 participants), prices (10 participants), getting everything (4 participants) and distance (3 participants).

Figure 5.7 Summary of consumers' reasons for choosing other retailers.

Consumers were asked how they travelled to FMs to clarify whether the distance was a primary reason for choice of shopping location. Eighteen consumers indicated they arrived at FMs 'by car', and seventeen said 'on foot'. Other consumers indicated they travelled 'by bus' (2 participants), 'by bike' (1 participant), and 'by motorbike' (1 participant). Then they were asked how long the journey took. Thirteen consumers indicated that they arrived within five to ten minutes. Another nine consumers reached the FM within ten to twenty minutes.

Additionally, consumers were asked about their online habits (Fig. 5.8 below). Thirty-one out of thirty-nine consumers shopped online; other consumers did not. The main reason for online shopping was convenience (17 participants). 'Easier to see products' was the secondary motivation for online shopping (14 participants). Another eight consumers who do not prefer online shopping stated that they wanted to see what they would buy before making a purchase. Moreover, fourteen out of thirty-one consumers buy food online, and only one of them indicated they buy local food online. Eleven of the thirty-nine consumers said they use online platforms to learn about local food.

Figure 5.8 The number of consumers who prefer shopping online, shopping online for food, and for local food.

The final query was whether consumers would be interested in a new system to find local food. Twenty-nine of the thirty-nine consumers said they would be interested in a new online map-based system to learn about local food. The main drivers of their interest are that they wanted to learn more about where their food came from with one online platform, support local businesses, and eat locally produced food.

5.2.2 Research findings: vendor survey

In the survey of twenty-one vendors, ten identified their jobs as farmers, four as growers and four as gardeners. Another three did not want to define their jobs. Vendors were selling meat (6 participants), fruit (6 participants), vegetables (5 participants), eggs (2 participants), cheese (1 participants) and apple juice (1 participant) (Fig. 5.9 below). Some vendors sell both meat and eggs or cheese and eggs together.

Vendors were asked to indicate their motivation for being part of the FM. The survey results revealed that most vendors were involved in FMs because of staying local (11 participants) or money (5 participants). Further, seventeen of twenty-one said they are also involved in other FMs. Vendors who sell their products at farm shops (6 participants) represented the most common alternative to selling at FMs. Fourteen vendors indicated they do not do home delivery, but three other vendors sell from home.

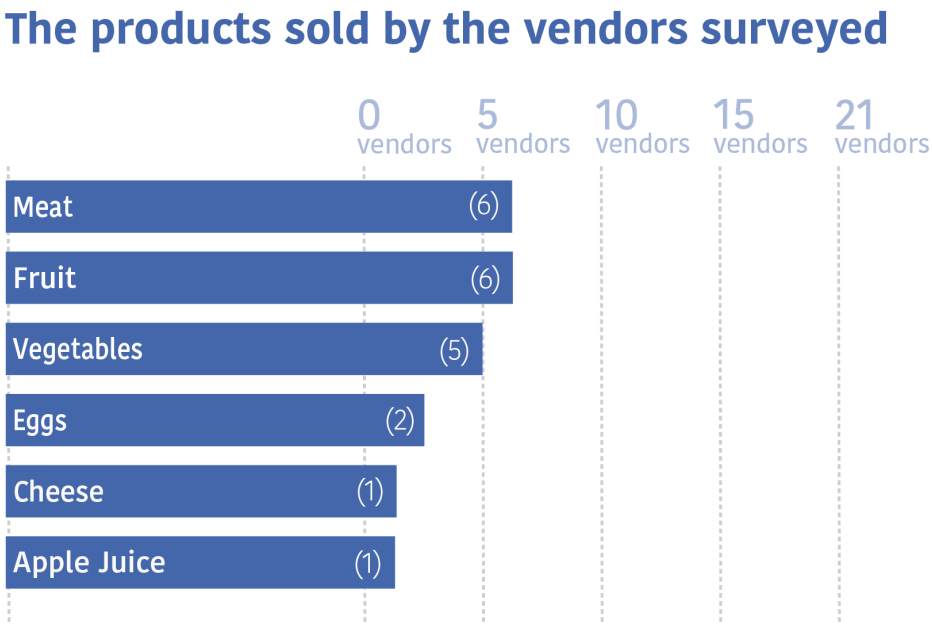


Figure 5.9 The products that vendors typically sell at farmers' markets.

According to the vendors, the primary motivations of consumers to visit their stalls are freshness, taste, quality, community involvement and locality. The consumers surveyed also addressed the same points as the reason for visiting FMs. Further, the vendors' responses also revealed their online habits (Fig. 5.10 below). Out of the twenty-one vendors, sixteen have websites. Of those, fifteen claimed that the websites accurately reflect their business. Others who did not have a website complained about the cost of having a one and limited time to deal with it. Fifteen of sixteen vendors who have a website indicated they use social media channels (Fig. 5.10 below).

Further, only six vendors out of twenty-one said they sell online (Fig. 5.10 below). Four of them sell through email, one through its business social media accounts, and one through another organisation's website. Vendors not interested in online selling cited reasons such as convenience (6 participants), time (3 participants), delivery cost (2 participants), being old or alone (1 participant), and packaging/delivery (1 participant).

Figure 5.10 The number of vendors who use a website, social media channels, and online sale channels.

Another question about online habits asked if they would be curious about an online product selling platform. Nine out of twenty-one said they would be interested in a new online system. The research findings clearly illustrated that time and delivery issues influence vendors' online habits. Nevertheless, the low level of interest in an online system needs to be assessed by considering which products the vendors sell and the vendors' business capacity, without generalising.

The vendor survey also asked vendors to answer selective questions about consumers to gather more information about the consumer profile, such as local people or nonlocal/broad locality. They described consumers as satisfied with their experiences in the market (21 participants), local people (17 participants), community-related people (14 participants), and part of a more scattered community (11 participants). Additionally, thirteen vendors indicated that consumers belong to a mixed age group.

To conclude, this research has used a survey at farmers' markets to understand locals' motivations for participating in FMs and their interest in locally produced food. In this regard, the survey collected locals' needs for a prospective local food map. So far, the last two sections have focused on the survey findings separately. The following section discusses the survey outcomes in detail to determine the requirements for a local food map that will reflect the users' (locals') needs.

5.2.3 Discussion of the survey outcomes

In this section, the findings obtained in the first phase of the research on local food and farmers' markets and the survey results are compared. This section discusses the meaning of local food, the desire of people to buy local food, the role of farmers' markets in buying and selling local food, and the social counterpart of the concept of local food.

The initial stage of this research on local food illustrated that local food is related to higher quality (Meyerding et al., 2019). Further, research on local food has shown that high-quality foods are distinguished by taste, freshness, healthiness and environmental friendliness (Meyerding et al., 2019). Similarly, the outcomes of the consumer survey in this research indicated that the higher quality of products, becoming more aware of what they eat, purchasing locally grown food and leading a healthy lifestyle are all reasons customers visit FMs.

Along the same lines, Sirsat, Gibson and Neal (2015) argued that consumers at FMs assume that the products sold there are environmentally friendly. In this research, the survey outcomes show that one of the reasons for shopping at FMs for consumers is access to local food. Further, the term 'distance' regarding locality in this research emphasises both food miles and staying local. Regarding food miles, FM products must have been produced within fifty miles to meet the definition of 'local food' (Harvey, 2008: 253). Supporting this view, Harvey (2008) claims that FMs can be assumed to be alternative local food points that meet consumers' concerns, such as taste, freshness and healthiness. Further, in the context of staying local, the market's accessibility is another factor influencing how frequently consumers visit FMs. In this regard, the consumer survey showed that more than half of the consumers arrive at the FMs within 20 minutes at the most. Moreover, the survey outcomes showed that vendors sell at FMs primarily to stay local, which would be more important than earning money. Even though consumers and vendors have practical reasons to involve themselves in FMs, such as the higher quality of products, or costs, both participant groups are interested in remaining local in their community.

In Chapter 2, the research on local food showed that being part of the same community and supporting local businesses are also consumer motivations for visiting FMs (Meyerding et al., 2019). In this thesis, the importance of feeling part of a community at FMs is one of the significant outcomes of the survey. In this way, FMs become a meeting point for both participant groups, where they easily find a topic to talk about. The conversations between consumers and vendors in the observation stage also emphasise social communication. Through these conversations between consumers and vendors, consumers can ask for detailed product information and talk about daily topics.

Moreover, local food research showed that food consumption differs between rural and urban consumers in the UK and is affected by other factors, like social class and age (Kemp et al., 2010). However, the survey study's findings do not indicate that age distribution is critical to FMs' consumer profile. According to survey results, customers belong to a mixed age group.

Beyond the research on local food and FMs, this research investigates both participant groups' online habits. Consumer responses in the survey pointed out that even though consumers generally engage with online shopping, they prefer not to shop online for food. Nor did they promote any other online local food retail stores. One possible reason is that FMs allow consumers to see the products that they want to buy and to talk to the vendors. This research suggests that online habits need to be evaluated from the consumers' perspective first because this can reveal the relationship between supply and demand. However, if consumers demand local food on an online system designed for their needs, the vendors at FMs *might* supply that demand. That is because vendors' interest in selling online depends on business capacity and types of products as well as consumers' online shopping demand.

The survey outcomes showed that the frustration points are generally aggregated into consumers' and vendors' online shopping/selling habits. Although the vendor survey showed that money is a secondary reason for involvement in FMs, the vendors are not currently interested in online selling, where they might

also make a profit. Most vendors have a website (16 participants), yet they prefer not to use it for online selling. This preference needs to be justified in terms of both their online behaviours and business capacity. The survey outcomes illustrated that practical issues such as delivery costs, packaging, and time significantly affect online selling. On the other hand, these concerns might likely be raised specifically by meat or cheese stallholders. Indeed, determining what vendors sell at FMs is critical to figuring out the vendors' concerns. For instance, if a cheese seller raises some issues, these are likely about delivery time that causes products to spoil. Likewise, some vendors might not want to deal with packaging and delivery issues because of working alone. However, the consumer survey showed that mainly bread, vegetables, pastries, meat and fruit are bought at FMs. Further, the observations at FMs showed that vegetable stallholders, including a mixed age group of workers, usually work as a family, and young family members support their parents at FMs. Some vendors verbally indicated that they ask their young family members to help run their social media accounts for advertising. However, vendors do not prefer social media channels as a direct way to promote their sales. Thus, the vendors' online selling and social media interest should be considered based on what products they sell and their business capacity.

To conclude, FMs have been chosen in this research as a way to understand the interest in locally produced food. The survey outcomes showed that user needs for a digital local food map are based on issues aggregated in some specific areas:

(1) The meaning of 'local food' has been put forward with some precise points by locals, namely food quality, supporting local business, knowing more about what people are eating, buying local food, and healthy eating/lifestyle.

(2) Consumers and vendors who engage with buying/selling local food are also interested in remaining local.

(3) Communication is the key to buying/selling at FMs. In this way, consumers can ask for detailed information about products and relieve their anxiety about the food

they buy. Likewise, vendors can maintain the feeling of remaining local owing to the familiar topics they talk about.

(4) Practical issues, such as delivery cost and packaging, greatly affect online selling for vendors. Nevertheless, vendors' interest in online selling should be assessed within other parameters, such as what products they sell and their business capacity.

(5) A local food map similar to most online navigation systems that overlooks user needs and focuses only on interface design is not likely to be successful, because obtaining detailed information about the products is as important as accessing the local food for consumers.

(6) Opportunities for social interaction should be considered in a local food map that aims to provide information about locally produced food. That is because consumers and vendors place importance on their social relationships at FMs and love to talk about local/daily issues.

(7) Representing the localness/distance information that is directly relevant to mapping is one of the most critical issues, as consumers identify local food as a higher quality of food that avoids food miles.

Following on from this, the section below discusses the map requirements to design a user-friendly local food map that considers the survey outcomes.

5.3 Determining the local food map requirements

This section identifies the consumer- and vendor-based local food map requirements. Based on the survey outcomes, the requirements for local food maps focus on three main points: (1) Customers visit FMs to get information about the quality and details of locally produced food, as this will ease their concerns about the products they purchase. (2) Customers visit FMs to have an opportunity to ask for specific product information, such as

where foods are produced (distance/location). (3) Farmers' markets allow consumers and vendors to talk about products and agenda, promoting community involvement.

In this stage, more specific questions in the design cycle are asked to present the points above in a map interface that meets user needs for a local food map. The questions are gathered under five main headings: (1) **Who is the user?** Are they a consumer or vendor? (2) **What is the intention of the user?** If they are a consumer, do they want to find out about locally produced food, find the closest local food shop, or get information about the next FM set? Do they want to communicate with vendors? If they are a vendor, do they want to show what is sold at their farm/farm shop? Do they want to give information about delivery options, and do they want to communicate with customers? (3) **How can user intention be met regarding the food quality?** Through detailed product information or presenting communication methods for consumers and vendors? (4) **What motivates users?** Giving information about the product quality, such as taste, freshness and food miles, showing the price of the products, or presenting a comparison of the price and quality together? Money for the vendors? (5) **What frustrates users?** Not being able to see detailed information about products? Accessibility, delivery, or packaging?

Based on these questions, this research clusters the consumer- and vendor-based requirements into three main groups: **(1) Geographical proximity, (2) Detailed information about local food/earning money, and (3) Communication between consumers and vendors** (Figs 5.11 and 5.12 below). Even though geographical proximity is presented in two requirement lists in Figures 5.11 and 5.12, their contents might slightly differ from each other because of the responses of the consumers and vendors surveyed. In the consumer-based requirements, geographical proximity might mean seeing the closest local food point, knowing about food miles and information about how to get the products/go there using a map (Fig. 5.11 below). However, geographical proximity in vendor-based requirements can imply staying local (Fig. 5.12 below). Moreover, the notion of distance is also essential in the context of geographical proximity for two reasons: (1) To clarify the distance that defines local food because

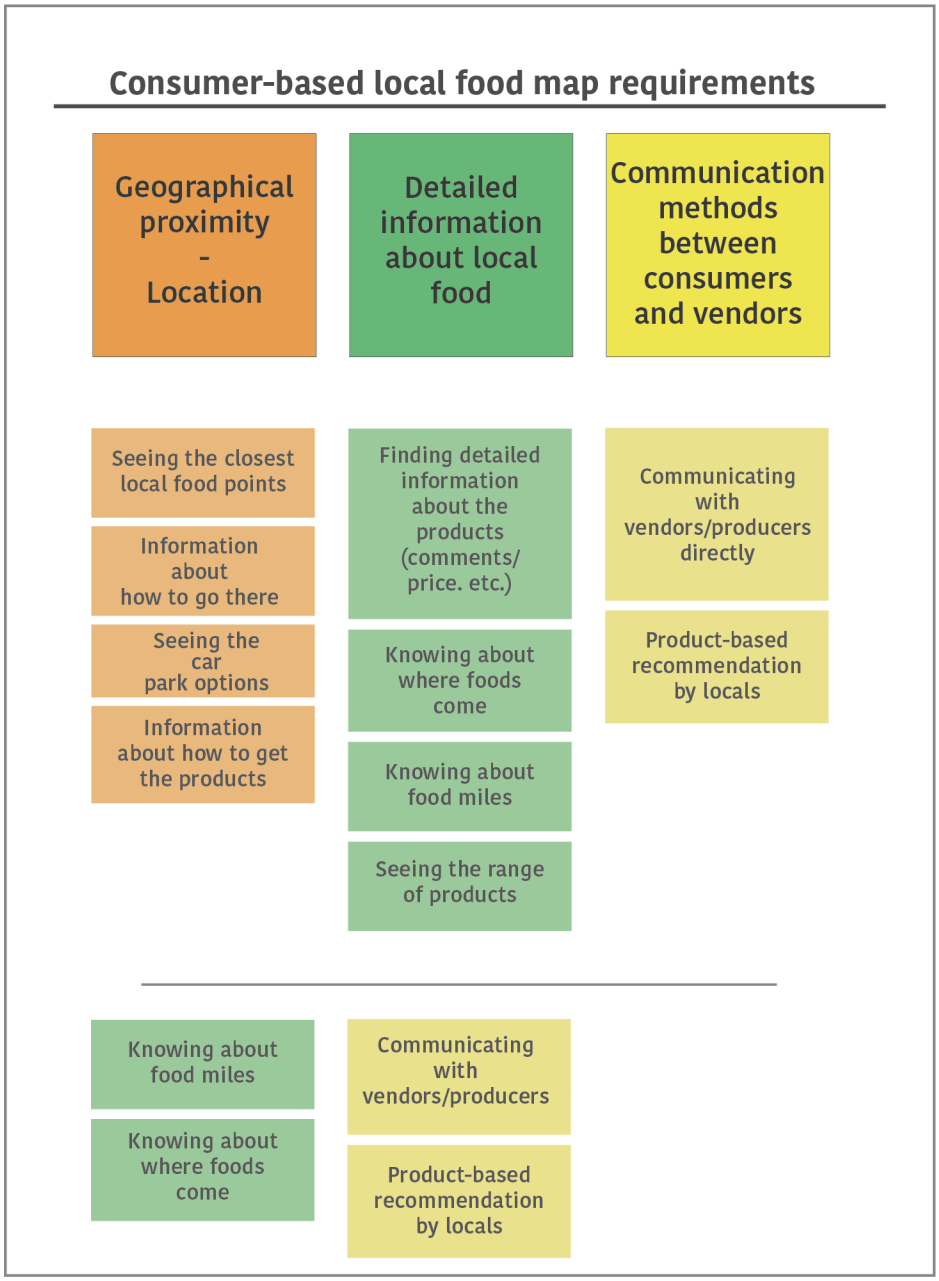


Figure 5.11 The requirement list based on the consumer survey outcomes – the consumer-based local food map requirements.

of environmental footprint and carbon emissions. For instance, FM products must have been produced within fifty miles, referring to a geographical restriction regarding distance. (2) More than half of the consumers arrive at the FMs within twenty minutes, so consumers prefer to stay in a local area that also reflects the distance restriction for local food.

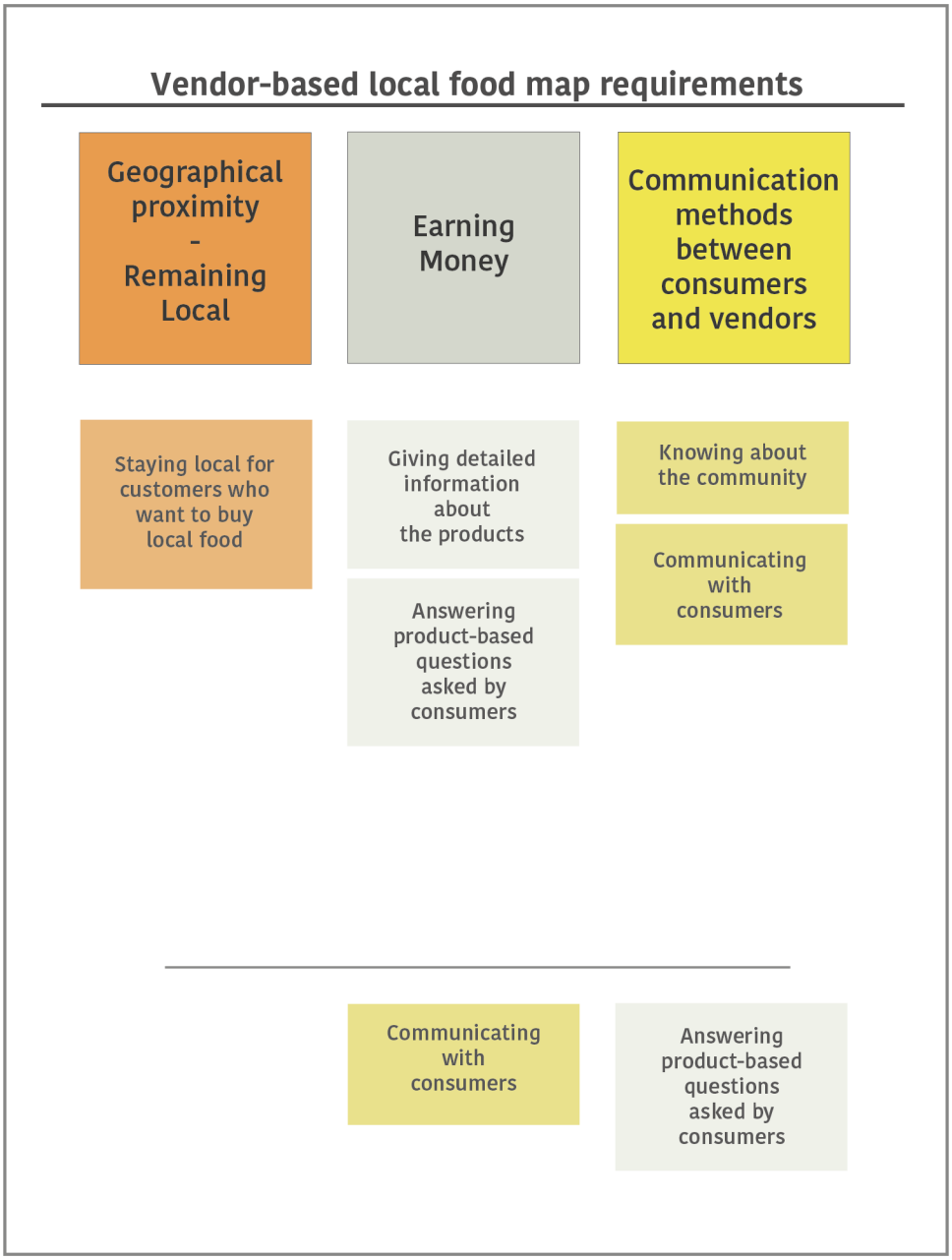


Figure 5.12 The requirement list based on the vendor survey outcomes – the vendor-based local food map requirements.

Further, one of the motivations for visiting FMs was claimed by consumers in the survey to be ease of access. This motivation might be divided into two titles in the consumer-based map requirements as 'information about how to go there', which refers to the geographical proximity, and 'information about how to get the products', which refers to the way of shopping (Fig. 5.11 above). Earning money is highlighted by vendors rather than detailed information about local food in the vendor-based requirements, as the vendor survey indicated that money is the second reason

for vendors to be involved in FMs. Moreover, the issue of remaining local emphasises the relationship between consumers and vendors, and this relationship sees the FMs as a meeting point for locals in the context of community involvement and underlines social communication. In this way, vendors can give detailed information about the products and answer the product-based questions that are asked by consumers (Fig. 5.12 above).

The survey outcomes also indicated the users' possible frustration points (see Sections 5.2.2 and 5.2.3 for the survey outcomes). Even though consumers shop online, purchasing local food online can become a source of frustration. Likewise, the vendors' online selling or social media habits might be limited because of convenience, time and delivery costs. However, this thesis assumes that vendor-based requirements will primarily be shaped by consumer demand, and well-designed information that users (consumers) need might encourage consumers to shop for local food online using a map.

Indeed, this section determines the content of a prospective local food map that will meet local food map users' needs, including showing the closest local food points, reducing consumers' anxiety over the food quality, providing detailed information about the products, and presenting communication opportunities. The following section reframes these requirements and uses them to develop personas.

5.4 Creating personas

This stage employs persona development as an effective user research method to specify the user needs and enhance user engagement in the design process. Creating personas clarifies the local food map users' needs in parallel with the local food map requirements and facilitates preparing user scenarios in the next stage.

The first step here is to consider the main characteristics of the target user group to develop personas that reflect the typical local food map users. The survey outcomes and local food map requirements showed that users could have different needs,

interests and positions living in local communities and different shopping habits. In this regard, the two consumer and two vendor persona cards reframe the local food map user needs that would be transferred to the visualisation workshop tasks (Figs 5.13, 5.14, 5.15 and 5.16 below).

The characteristics of the personas reflect the user research steps from the beginning. For instance, all the personas live on the border of the research area (see Section 4.2 for the justification of the research area), belong to different income groups (see Section 4.3.1 for the income level analysis for the three counties), and are a mixed age group (see Sections 4.3.1 and 5.2.3 for the age distribution data and survey outcomes). The consumer personas reflect the local food map users who buy locally produced food, have concerns about the food quality they would buy, want to ask producers questions directly, and have different online habits. Likewise, the vendor personas reflect the typical end users who grow/sell local food, need money and are a part of their community.

The consumer personas are one retired couple, Barbara and Tom, and one doctor, Charlotte (Figs 5.13 and 5.14 below). Barbara and Tom, 60 and 65 years old, are a retired teacher couple and Charlotte is a doctor. Both personas' demographic features are compatible with the user research outcomes of this thesis, and both live within the boundaries of the research area. They have mixed age groups and different income levels.

Further, their behaviours, actions and needs are fed from the requirement list based on the survey outcomes (see Sections 5.3 and 5.2.3 for the survey outcomes and local food map requirement lists). Barbara and Tom are not interested in buying local food online. They keep in touch with their community by referring to the social side of the local food topic. They visit FMs both to find local food and to socialise and want to ask the sellers about the food they want to buy. Considering the local food stakeholders' mechanism, they are associated with other institutions dealing with local food (see Section 2.1.1 for more details on the local food stakeholder mechanism). The expectations for a local food map from the couple with these behavioural characteristics are as follows: (1) knowing where the food comes from, (2) seeing the

nearest local food shop (distance), (3) seeing the car parking option, (4) contact the seller, (5) knowing how to get the local food (Fig. 5.13)[1]. Further, for this persona, the frustration points can be aggregated into: (1) not being easily convinced about the food quality, (2) distance, and (3) not being keen on technology and online shopping for local food (Fig. 5.13).

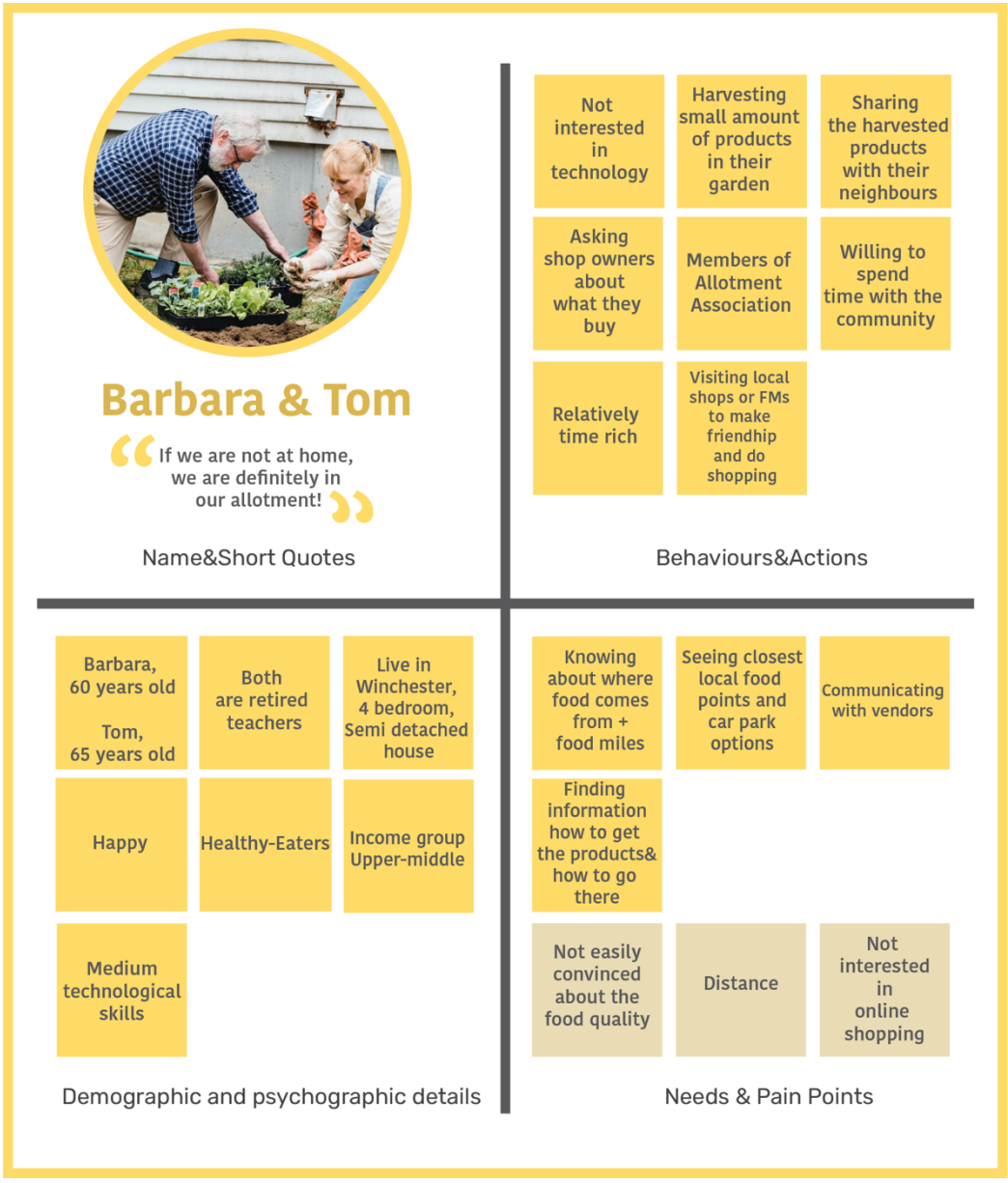


Figure 5.13 The consumer persona card showing information about the retired couple, Barbara and Tom, including demographic and psychographic details, behaviours and actions, needs and pain/frustration points.

[1] The image of Barbara and Tom retrieved from the *Senior couple working together in garden* by Greta Hoffman is marked with CC0 1.0. To view a copy of this image and license, visit https://www.pexels.com/photo/senior-couple-working-together-in-garden-7728055/

Charlotte also keeps in touch with the community, but online. She is a member of the British Dietetic Association, which might be a relevant institution regarding local food (see Section 2.1.1 for the local food stakeholders). From Charlotte's point of view, the expectations for a local food map might be as follows: (1) seeing the closest local food shop, (2) seeing the range of products, (2) seeing the reasonable price, (3) knowing about food quality, (4) seeing the car parking option (Fig. 5.14)[2]. The frustration points are aggregated into: (1) not offering different delivery options and not seeing detailed product information (Fig. 5.14).

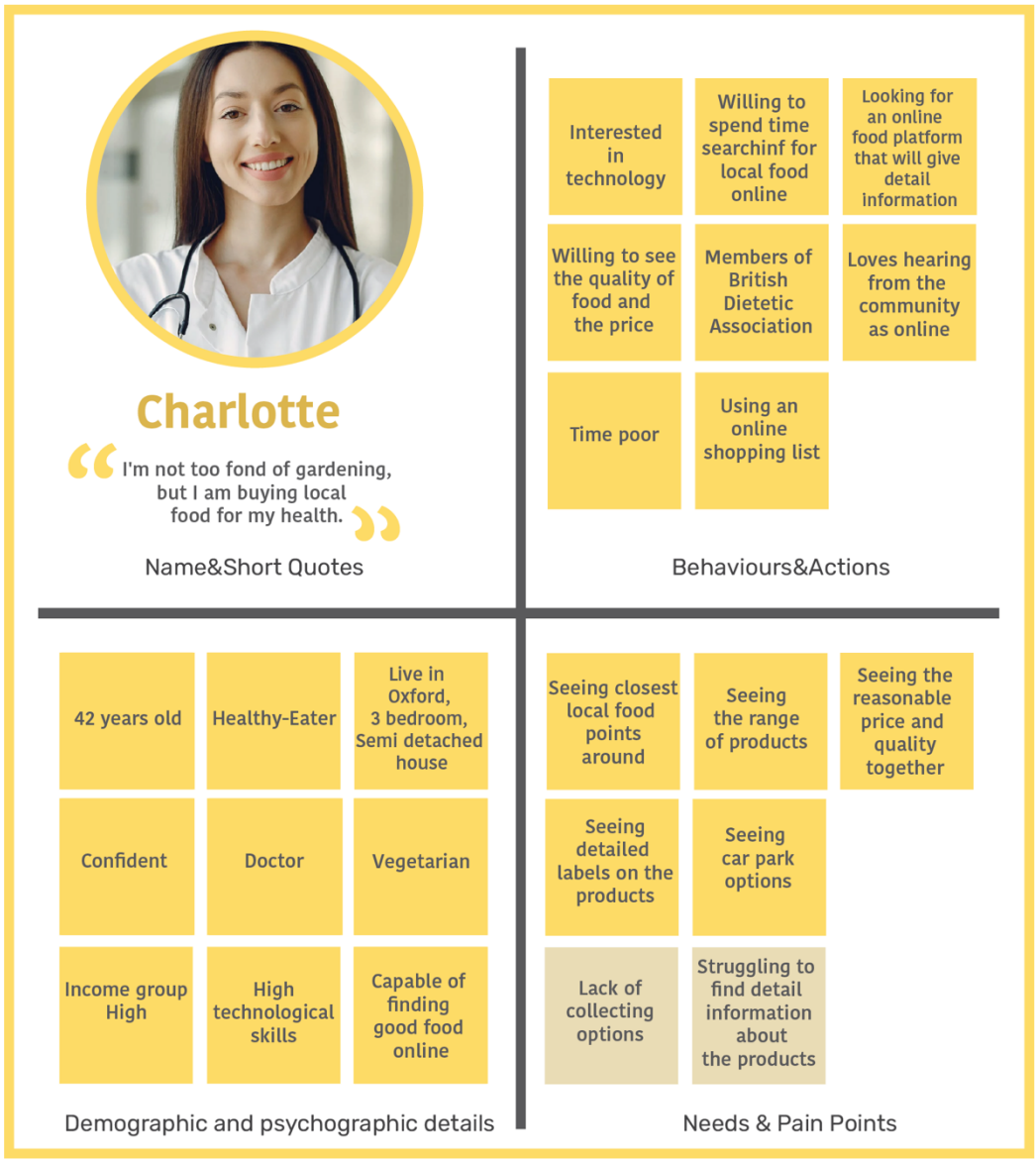


Figure 5.14 The consumer persona card showing information about the second consumer persona, Charlotte, including demographic and psychographic details, behaviours and actions, needs, and pain/frustration points.

[2] The image of Charlotte retrieved from the *Crop doctor in medical uniform with stethoscope standing in clinic corridor* by Gustavo Fring is marked with CC0 1.0. To view a copy of this image and license, visit https://www.pexels.com/photo/crop-doctor-in-medical-uniform-with-stethoscope-standing-in-clinic-corridor-4173251/

The vendor personas are the vendor/farmer, Rob, and the vendor/farmer siblings, Millie and Henry (see Figs 5.15 and 5.16 below). They have different age groups, income levels, and demands for local food selling because of their business capacity.

Figure 5.15 The vendor persona card showing information about the first vendor persona, Rob, including demographic and psychographic details, behaviours and actions, needs and pain/frustration points.

Rob is not interested in technology to sell his local products (Fig. 5.15)[3]. He has a relatively small farm and wants to sell his vegetables and fruits to local shops or farmers' markets. Rob keeps in touch with his community as he likes small talk with his customers. Considering the local food stakeholders' mechanism,

[3] The image of Rob retrieved from the *Father And Daughter Gardening* by Gustavo Fring is marked with CC0 1.0. To view a copy of this image and license, visit https://www.pexels.com/photo/father-and-daughter-gardening-4894603/

he is a member of the National Farmers' Union. Rob has a simple website and a social media account to promote sales on a local basis. He is willing to show the quality of his products. The expectations of Rob, with these behavioural characteristics, for a local food map are as follows: (1) showing the range of products, (2) giving detailed information about his products, such as taste, freshness and price, (3) giving information about the accessibility of the products, and (4) showing reasonable price, thus earning money (Fig. 5.15 above). Further, the frustration points might be aggregated into: (1) packaging and delivery problems and (2) lack of time (Fig. 5.15 above).

Millie and Henry have inherited a relatively large farm in Banbury (Fig. 5.16 below)[4]. They want to promote their sales online, so they are interested in technology. They are willing to engage with the local community and use their website and social media channels. They are members of some farming and food associations. Their expectations for a local food map are as follows: (1) showing the range of products with a good representation, (2) giving detailed information about their products, such as taste, freshness and price, (3) giving information about alternative delivery options they have, (4) earning money, and (5) showing reasonable price and quality together (Fig. 5.16 below). Further, the frustration points might be aggregated into: (1) lack of online communication alternatives with their customers, (2) lack of displaying alternative delivery options online, and (3) struggle to deliver time-sensitive food, leading to spoilage (Fig. 5.16 below).

[4] The image of Millie and Henry below retrieved from the *Man and Woman Checking the Vegetables* by Kindel Media is marked with CC0 1.0. To view a copy of this image and license, visit https://www.pexels.com/photo/man-and-woman-checking-the-vegetables-7457502/

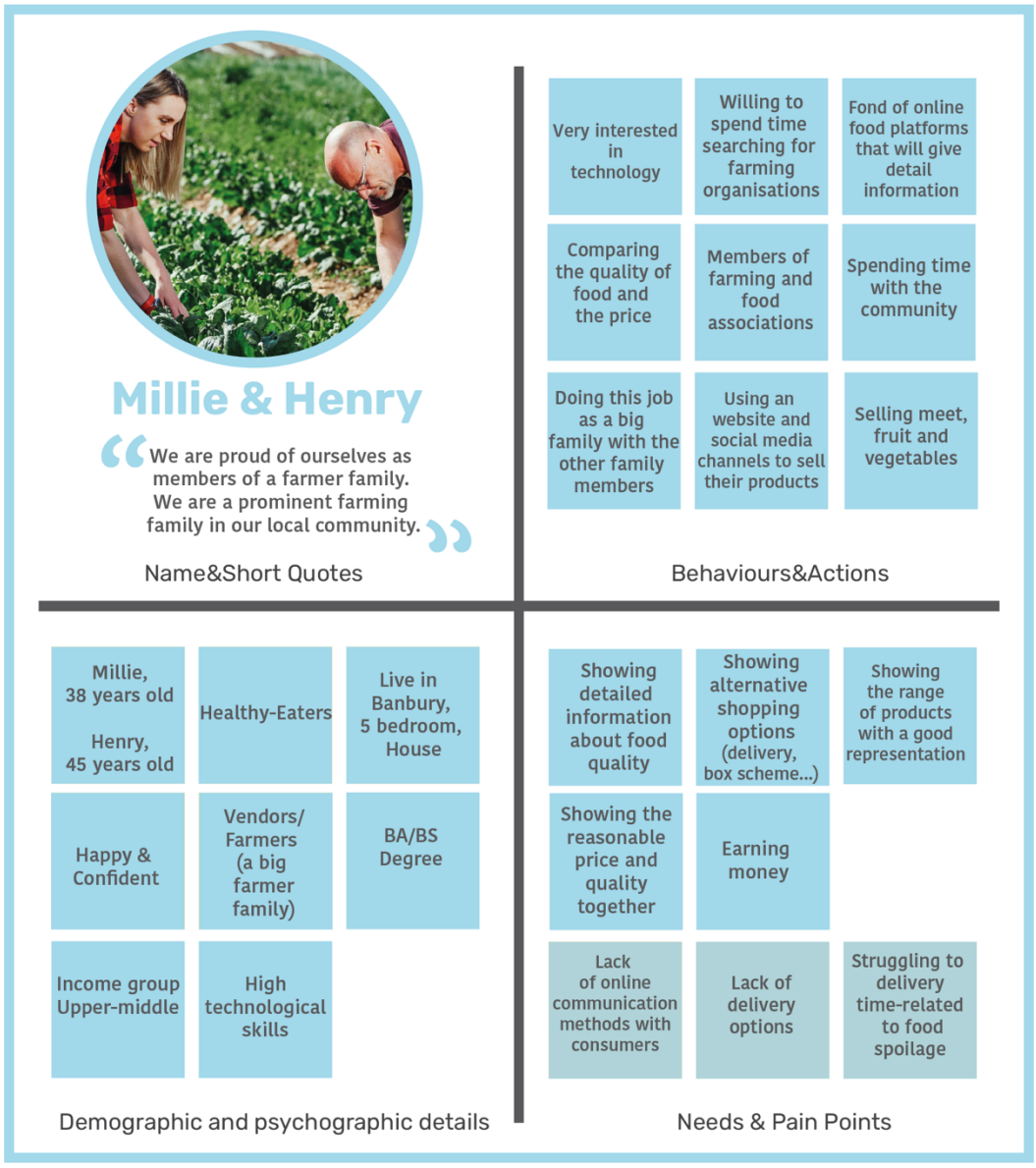


Figure 5.16 The vendor persona card showing information about the second vendor personas, Millie and Henry, including demographic and psychographic details, behaviours and actions, needs and pain/frustration points.

This section has developed personas referring to the survey outcomes and vendor- and consumer-based local food map requirements. In doing so, the former research stages have been interpreted and fixed with imaginary but realistic people, and in the next section, user scenarios are developed based on the personas.

5.5 Developing user scenarios

The section below employs the user scenarios to move the information about local food map users from the research stage to the design stage. Scenarios are described as 'a bridge between research and design' that would meet design needs (Ross, 2013). The four scenarios in this section reform the user needs deriving from previous research steps. These scenarios tell consumer and vendor stories. They do not show how individuals would carry out the tasks on a local food map but are used as a preliminary step to prepare the user tasks that are transferred to the visualisation workshop in further stages. The parts written in bold on the scenarios show the points to be assigned to the visualisation workshop tasks. Thus, user scenarios used in this research determine the visualisation workshop tasks, simplify how users' needs can be transformed into a map environment and clarify how accessible and applicable the local food map users' needs are. The scenarios are developed with reference to the requirements list and are as follows:

Scenario 1: Barbara and Tom, the local food lovers

Barbara and Tom, 60 and 65 years old, are a retired teacher couple. They usually want to buy ***fresh fruit and vegetables from FMs.***

However, if there were ***a product-based detailed information system*** *to determine* ***the food quality****, they would prefer to buy online.* ***Food quality means knowing where food comes from and others' opinions/comments.***

They can be deemed as healthy eaters because of their state of health. After retirement, they bought a small allotment because working with the soil would benefit their mental and physical health. They grow tomatoes, cucumbers, beans and lettuce in their garden and have hens giving them fresh eggs, but sometimes shop for this food. Barbara and Tom also want to share their produce with their neighbours if they harvest a lot. For example, if they want to sell/share harvested beans, they use the Nextdoor application for the announcement. In this way, the neighbours usually collect the products from the door. This means that even though they do not like technology, they love using it to collaborate with others.

They specifically look for ***a local food map system to see the closest local food shops around.*** *That is because they are also obsessed with* ***food miles.*** *For the same reason, they only buy from local shops or farmers' markets except for their garden products. In this way,* ***they ask any questions about the products*** *to relieve anxiety, such as about food miles, quality and freshness. Even if they want to use technology as little as possible, they also would like to have an opportunity* ***to ask their product-based questions to sellers online****. Convenience is essential for them, and both know what they want to buy and* ***do not expect complex information****. Tom is also keen on reading* ***locals' comments*** *to find out about the food quality.*

Scenario 2: Charlotte, the busy doctor

Charlotte, 42 years old, is a doctor. She is capable of finding good quality food online.

Charlotte wants to have a map system that shows the local food points around. *Her technological skills are good, but she has little time to cook or shop. Charlotte's main problems with shopping are the lack of time and the lack of collecting options. For this reason, if she* ***finds local food points on a map****, she can pop there to buy what she needs when returning from the hospital.*

She rarely visits local shops that sell higher-quality food. According to Charlotte, the most challenging part of online shopping is comparing quality and prices. Even though she is interested in technology, she usually gets stuck at this point. She wants to see ***quality and prices together*** *in an online system explicitly.*

Further, she loves hearing from the community online and following community-based social media accounts. If she goes to local shops, she likes chatting with sellers. The small talk also allows her to easily explore new products she cannot see on online applications. For this reason, Charlotte pays attention to ***the recommendations from locals*** *online. Lastly,* ***the car park option*** *is vital for choosing the local food points.*

Scenario 3: Rob, the farmer/vendor

Rob, 50 years old, is a farmer/vendor. He is just selling fruit and vegetables, and he uses conventional farming methods on his relatively small farm and sells products in the place of production, local shops, or FMs. However, he also wants to see other potential customers around because he delivers only within 1 or 2 miles.

He also loves FM collaboration because he ***likes chatting with consumers****. He is pretty chatty. When a consumer asks a question about his products, his answer can take half an hour. He does not like online platforms as they do not allow communication, but he still uses a website and social media channels to promote sales on a local basis.*

He is very ***keen on answering product-based questions*** *online because he wants* ***to give detailed information about the products****, such as where food comes from, which farming method is being used on his farm and which products are seasonal. Rob also complains about not showing the quality of his products correctly on his website. Even though Rob is not interested in technology, he would like* ***to offer the quality and range with price together*** *online.*

Scenario 4: Millie and Henry, members of a relatively big farming family

Millie and Henry – 38 and 45 years old – are siblings and farmers. They have a relatively big family farm using modern farming methods and sell meat, fruit and vegetables. However, they need a map-based website. That is because customers are unhappy with not finding their products' selling points. Their farm shop is only open 9 hours a day. However, their products are distributed to local shops daily, and this situation changes delivery options. This farm usually works with a box scheme, but some local shops have various delivery options. For this reason, they ***want to show various shopping points with different delivery options*** *for their own products on a map-based website.*

Their customers also complain about not seeing detailed product information based on small talk questions such as 'Is this organic? / Are they fresh? / How about food-miles?' They want handy information about the products on Millie and Henry's websites. Millie and Henry consider these requests part of the food quality. For this reason, they want to ***show the reasonable price and quality together (others' opinions/comments)*** *on a map-based system.*

Further, they want to keep their good relationship with the customers because they have a good relationship with the community as a whole family. For this aim, a ***new map-based website/application should also offer creative communication methods****. In contrast to other small farmers, they are fond of online platforms and social media channels and are willing to spend time talking to customers online.*

To summarise, the four scenarios in this chapter draw on user research conducted since the early stages of this thesis and determine users' needs that would be transferred to the visualisation workshop. The following chapter employs these user scenarios to prepare the tasks conducted in the visualisation workshop.

5.6 Conclusion

This thesis assumes that for a local food map to be usable, it has to be designed with a proper understanding of user needs. In this regard, usability can be enhanced by identifying user needs and potential risks in developing the interface avoided by identifying frustration points. Therefore, this chapter elucidates local food map requirements based on local food map user needs and frustration points.

This chapter initially investigates locals' motivation to visit FMs and their interest in locally produced food with a questionnaire survey. The survey outcomes support the previous research on the meaning of 'local food' used in this study. Local food was defined with some precise points by locals, namely taste, freshness, healthiness, trust, lower fuel emissions (due to shorter distances travelled in a local context) and supporting local businesses in the context of food. Moreover, the survey findings showed that a digital map for finding locally produced food should offer more than a navigation system like current maps to find a location. In addition to the digital maps that help find a route, local food maps should include detailed information about local food and social communication opportunities. In this way, consumers might learn about what they eat, and many concerns about food might be relieved. Based on these points, the personas' narratives uncover design practice points which assist in determining the functionality of a prospective local food map. The scenarios emphasise the interface elements of a local food map to be explored, considering the users' needs. In the next stage, user scenarios are moved to the visualisation workshop stage to prepare user tasks. The following chapter focuses on the visualisation workshop, where information designers create the local food map interface elements.

6 Visualisation workshop

This chapter investigates designing a local food map interface that would encourage people to find information about local food. While a user-centred approach in the early stages of design points out user needs to guide the local food map design, every mapping activity initially addresses gathering geographic data and visualising the data accurately. This section carries the data obtained from user research conducted for this study, rather than geographical data, to the design practice with an online visualisation workshop. Thus, this chapter focuses on local food maps' interface elements – map symbols, graphical variables and labels – which information design practitioners investigate with the online visualisation workshop.

The visualisation workshop outcomes are analysed considering the design principles proposed by information design. The design criteria involve clarity, simplicity, emphasis, unity, readability and legibility, which promote the functionality and usability of a local food map and make the digital maps more user-friendly. It discusses how the design criteria will affect the legibility and readability of the local food map interface in cases where they are considered or not (see Section 2.4.1 for more details on the design criteria). In this regard, this review particularly explores how the symbolic language of the local food map interface should be (pictorial/mimetic or geometric/abstract), whether evocative symbols can be suggested for a local food map and how the variables proposed by the cartography can be addressed in symbol design. Therefore, this chapter discusses the visualisation workshop that focuses on how information designers' decisions on the symbol design of a local food map would affect communication between map makers and map users.

6.1 The structure of workshop tasks

The visualisation workshops were conducted online with two rounds on 6 July and 2 August 2022, using Microsoft Teams. The workshops each ran for two hours with two participants, who were recruited via an advertisement announced by the

Department of Typography and Graphic Communication, University of Reading (**Appendix 3.C**). One MA and three PhD students/practitioners were involved in the workshops. The participants filled out an information sheet about the workshop and signed a consent form before the workshop (**Appendix 5.D**).

The designers were asked to consider the user tasks that were prepared considering user scenarios created in the previous stage of the research.

Two different materials were used for the workshop (**Appendix 3.A and Appendix 3.B**). **Appendix 3.A** was shown to the participants, and they were given a short explanation as a guide before starting the workshop. It describes point symbols, line symbols, area symbols, variables, and their use areas (examples) to clarify the tasks. **Appendix 3.B** consists of the questions and tasks I verbally put to the participants. Before the workshop, the participants were sent three monochrome Google digital base map images showing my research area (Berkshire, Hampshire and Oxfordshire), as shown in **Appendix 3.B**. The participants worked on the tasks with these base maps in Adobe Illustrator, considering **Appendix 3.A** as a guide. During the visualisation workshop, the participants were guided through Task 1 and Task 2 and their subtasks in **Appendix 3.B**, with the time required for each indicated. At the end of each task, designed visuals were uploaded to a shared OneDrive folder as .ai documents, the native file format for Adobe Illustrator.

The user scenarios, in which the user needs have been developed by collection in the previous step, were used at this stage to determine the tasks to be researched in the visualisation workshop (see Section 5.5 for the user scenarios). The user scenarios were re-formed to prepare the user tasks explored by the designers during the workshop (see **Appendix 3.B** for more details on the visualisation workshop tasks). The two consumer-based scenarios were combined, and the tasks researched through a single-user scenario, as the stories show parallelism at some points. To this end, the consumer-based tasks investigated in the visualisation workshop continued based on the story of the retired couple, Barbara and Tom. The retired couple's story explores three main visual research points based on the

requirement list in Section 5.3: (1) Spatial information, (2) Detailed product information and (3) Graphic variable shapes (pictorial/mimetic and geometric/abstract) (see Table 6.1 below for the consumer-based user scenarios, the tasks and task classification).

The spatial information tasks probed the geographical data representation to explore the closest local food shop, where the cherry tomatoes come from and the lower/higher CO_2 emissions route concerning distance/mapping exercises (see Table 6.1 below for tasks 1.2, 3.1 and 3.2). *The graphic variable shape tasks* asked the participants to produce an essential local food map landmark catalogue with appropriate symbols, such as a local food shop/seller symbol, a transportation symbol, a product symbol (cherry tomatoes), and a car park symbol (see Table 6.1 below for tasks 1.1, 1.3, 1.4 and 2.3). (3) *The detailed product information tasks* explored how the detailed information about the products, such as quality, prices and customers' comments, could be placed on a local food map's interface without cluttering map information (see Table 6.1 below for tasks 2.1 and 2.2).

Furthermore, the two vendor user scenarios developed in the early stages were combined into one user scenario in the story of Rob, reflecting vendor-based user goals (see Table 6.2 below for the vendor-based user scenario examined in four main tasks). The vendor scenario summarises four visual research points classified into *the graphic variable shape tasks* (pictorial/mimetic and geometric/abstract) (see Table 6.2 below for tasks 1.1, 1.2, 1.3 and 1.4). The tasks extended the investigation of the local food landmark catalogue by asking the participants what the vendor-based needs are, such as farm shop symbols, delivery option symbols and car park symbols.

Table 6.1 The consumer-based user scenario, divided into three parts. Each scenario was carried out on three different base maps by the participants. The sub-tasks of each part are classified depending on their visualisation research point as Graphic Variable Shapes, Spatial Information and Detailed Product Information.

Consumer-based user scenario - Part 1: Barbara and Tom live in Winchester, Hampshire. Their postcode is SO22 4AH, as shown on the map. They want to buy some cherry tomatoes from the closest local food shop. They are looking for detailed information about cherry tomatoes' quality (taste or freshness) and food miles. In order to ensure the quality of products, they want to contact the seller.		
Task 1.1	Please draw one local food shop/seller around Barbara and Tom's house with **a point symbol with/without variables and labels** on the map.	*Graphic Variable Shapes*
Task 1.2	Please duplicate the local food shop symbol you created in Task 1.1 on three different points. Then show the hierarchy between them depending on the proximity of Barbara and Tom's house using **point/line/area symbols with/without graphic variables and labels**.	*Spatial Information*
Task 1.3	Please choose the closest local food point to Barbara and Tom's house you have shown in Task 1.2. Then put one/two transportation symbols using **point/line/area symbols** for walking and/or cycling options around the closest local food point.	*Graphic Variable Shapes*
Task 1.4	Please choose the closest local food shop to Barbara and Tom's house you have shown. When you click this shop symbol, you will see that the cherry tomatoes are sold in this point/shop. Please draw **a point symbol with/without variables and labels** to show this information.	*Graphic Variable Shapes*
Consumer-based user scenario - Part 2: Barbara and Tom want to see customers' comments to understand the quality of the cherry tomatoes. Then they will check the price and quality before shopping. Lastly, if needed, they might want to contact the seller.		
Task 2.1	Please show a customer comment around the cherry tomatoes you indicated in Task 1.4 The comment will be displayed as: *"The taste and freshness are excellent! I loved it"*	*Detailed product information*
Task 2.2	Please put the price of the tomatoes around the customer comment, you have shown in Task 1.4 to display the price and quality together. The price will be shown as follows: *"1.5 kilos of cherry tomatoes is £11.50"* *You can edit the writing of the statement about tomato price to meet your design, as long as the relative values, however, expressed, remain the same.*	*Detailed product information*
Task 2.3	Please draw a communication **symbol, sign or button** somewhere you choose on the map, as a possible communication way between Barbara&Tom with the seller.	*Graphical Variable Shapes*
Consumer-based user scenario - Part 3: Barbara and Tom want to see detailed information about the cherry tomatoes sold in one local food point, specifically about the food miles (where the cherry tomatoes come from). The cherry tomatoes that Barbara and Tom want to buy come from Fareham to Winchester, as indicated on the map.		
Task 3.1	Please choose a, b or c. Then show your choice with/without variables to give the information about where the cherry tomatoes come from. a. Using **a line symbol** on the map b. Using **a semi-transparent layer** on the map c. Using **any symbol type** on a blank space around the map	*Spatial Information*
Task 3.2	Please show the higher CO^2 emissions for route a and the lower CO^2 emissions for route b below using map symbols and variables. a. Between Fareham and Eastleigh, 16.3 miles (higher CO^2 emissions) b. Between Eastleigh and Winchester, 9 miles (lower CO^2 emissions)	*Spatial Information*

Table 6.2 The vendor-based user scenario. This was carried one base map by the participants. Each sub-task is classified as Graphic Variable Shapes depending on its visualisation research point.

Vendor-based user scenario: Rob is a vendor and farmer in Hampshire. His products are distributed to local shops daily, and this situation changes delivery options for customers. He wants to show the other local food points that sell his products with alternative delivery options on the map. He thinks it would also be good to display the car park option of his farm for the customers who want to drive through.		
Task 1.1	Please put a point symbol with/without variables and labels on the map in Fig. 3 to show Rob's farm on the map.	*Graphic Variable Shapes*
Task 1.2	Please put three symbols with/without variables and labels on the map to show other local food points that sell Rob's farm products.	*Graphic Variable Shapes*
Task 1.3	Please add a point symbol to show one of the delivery options below to one of the local food points. • Home delivery • Click and collect	*Graphic Variable Shapes*
Task 1.4	Rob's farm has a car park. Please show it around his farm symbol that you have indicated in Task 1.1, using an appropriate symbol, with/without variables and text.	*Graphic Variable Shapes*

This section has summarised the structure of the visualisation workshop tasks. The following sections analyse the designers' responses within the three main investigation points: *Graphic Variable Shapes, Detailed Product Information and Spatial Information*. The following section initially discusses the consumer-based workshop outcomes in the *Graphic Variable Shape* group.

6.2 Designing consumer-based needs: Graphical Variable Shapes

This section draws attention to point symbols that can be pictorial and geometric and are primarily used as landmarks on maps (see Section 2.4.2 in Chapter 2 for the literature on the use of symbols, graphical variables and labels). The tasks in this section explore appropriate visualisation solutions for local food map landmarks with reference to the design criteria the designers considered to create symbols (See **Appendix 3.B**).

6.2.1 Is there a local food shop around?

In the first question in the workshop, the participants were asked to draw one local food shop/seller symbol near Barbara and Tom's house indicated on the base map image, using a point symbol with/without graphical variables and labels (see Table 6.1 in Section 6.1 for task 1.1).

Table 6.3 The local food symbols created by designers during the workshop. Each symbol was classified by its typographical attributes.

		Symbol Style	Type Style	Type Form	Type Size	Type Space	Type Colour	Symbol Background Colour	Ground Colour
Participant 1		Pictorial Symbol	Arial (San Serif Type)	Lowercase, Bold	18	Auto-Space	White	Green	Monochrome
Participant 2		Pictorial Symbol	Myriad Pro (San Serif Type)	Capitalised Each Word, Bold	13	Auto-Space	Black		Monochrome
Participant 3		Pictorial Symbol	Helvetica (San Serif Type)	Upper-case, Bold	12		White	Red	Monochrome
Participant 4		Pictorial Symbol							Monochrome

The workshop outcomes showed that the first participant created a pictorial symbol using a 'FOOD' label in the centre of a green building/house (Table 6.3). A symbol denotes a thing with a direct, indirect, or metaphorical meaning (Luna, 2018: 80). In this regard, the symbolisation of this example represents a 'food house', and it is likely to evoke locality with the sense of home. Further, the

green colour might be related to environmentally friendly food despite not providing an obvious and direct relation.

The label 'FOOD' facilitates the interpretation of the meaning in this example (Table 6.3 above). It uses Arial, classified as a sans serif font (type style). The attributes appear lowercase and bold (type form), 18 point (type size), auto-space (type space) and white colour (type colour). The font size (18 point) and visual contrast between type colour (white) and ground colour (dark green) for 'FOOD' facilitate the legibility of the symbol.

The second participant drew a supermarket trolley labelled 'Food Store' (Table 6.3 above). This representation can be pictorial as it is clearly associated with a physical object. However, in this example, it does not seem easy to establish a semantic relationship between local food and a supermarket trolley. In addition, the 'Food Store' label strengthens the shopping idea in the user's mind instead of local food. The label was written with Myriad Pro, a sans serif font, and placed above the pictogram. Each word was capitalised and written in bold, 13-point, auto-space and black. However, the 'Food Store' label was placed above the symbol on the map base directly, and this representation is likely to create clutter or ambiguity on the ground considering the contrast, as it is without a background.

The third participant drew a red apple symbol with an 'L' letter (Table 6.3 above). Even though apples link to local food, it is more food/fruit in general, and this symbol could be interpreted as an apple shop by users. The 'L' placed in the centre of the apple with an optical balance is not in unison with the holistic meaning of local food. Associating the letter 'L' used alone with anything is likely difficult for users. In the typographical assessment, the 'L' was written in Helvetica, bold, upper-case, 12-point, and white. Thus, although clarity, simplicity and legibility are considered in the representation, it is not easy to evoke the idea of local food in users' minds in this example.

The fourth participant used a pictorial symbol (a coloured supermarket trolley) with a geometric element (a blue circle around the trolley), but this also does not evoke any relation to local food (Table 6.3 above). Further, the participant used images

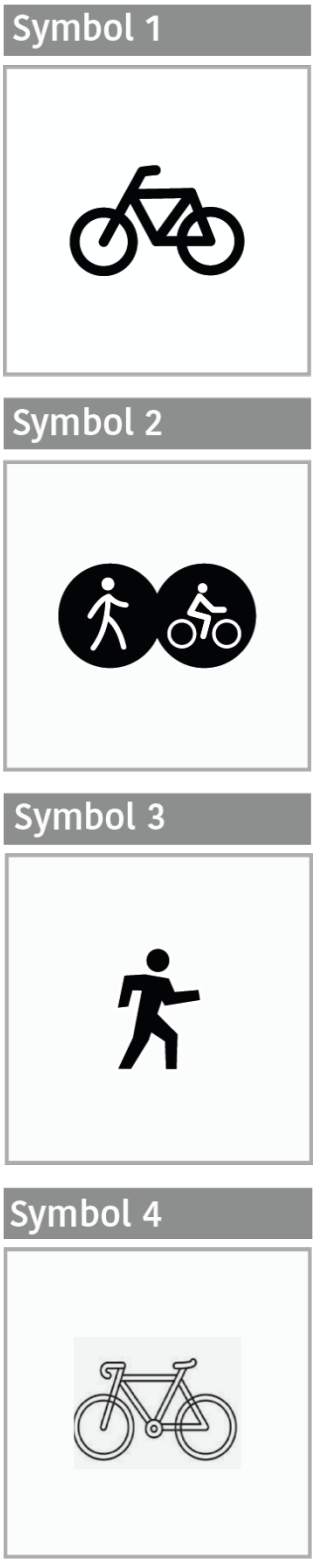


Figure 6.1 Responses from the designers/participants showing different symbols associated with transportation.

instead of a vector in this example. However, only vector base data can be uploaded and edited in mapping software, excluding geo-data. For this reason, this result has not been possible to test in mapping software in further stages of this research.

The outcomes of the first task conducted with the visualisation workshop illustrated that designers tend to draw pictorial/mimetic symbols instead of geometric/abstract ones. However, the abstraction levels of the drawn symbols were different, and none of them had a direct visual representation as evocative of a local food shop. Luna emphasises (2018: 81) that even a symbol with a direct meaning must have generalisation qualities that a realistic illustration of an object does not. However, two participants used the supermarket trolley as a local food signifier. Further, one drew a green house-shaped symbol, preferring a higher level of abstraction, and the other responded by representing a local food shop with an apple symbol, moving away from context. The outcomes showed that none of the participants answered this question with an associative symbol related to local food. Furthermore, while the 'FOOD' label used by the first participant strengthened the local food appeal, the 'Food Store' label used by the second participant supported the idea of shopping.

6.2.2 How can I travel there?

The second question in the graphical variable shapes group asked the participants to put one transportation symbol (point/line/area) for walking or cycling around the local food point they indicated on the base map image (see Table 6.1 in Section 6.1 for task 1.3).

The workshop outcomes showed that all the participants drew pictorial symbols representing transportation (Fig. 6.1). Three participants (Symbols 1, 2 and 3 in Fig. 6.1) directly used a bicycle or walking/cycling man symbol on the map. Symbol 4, showing a bicycle, is not a vector but an image. Further, the second participant drew both walking and cycling symbols on black background circles (Symbol 2 in Fig. 6.1). This representation increases the visual contrast by separating the symbol and

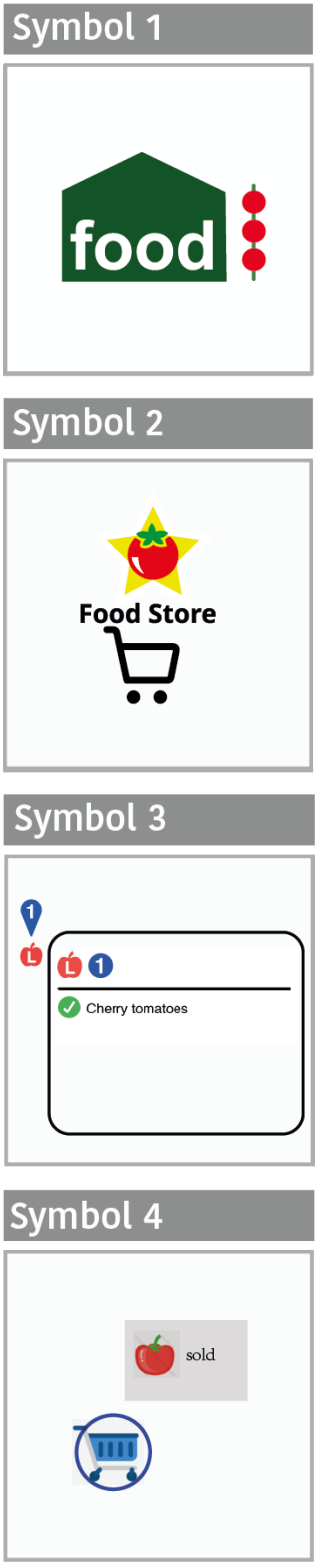


Figure 6.2 The designers'/participants' responses to displaying a cherry tomato symbol at the local food store.

ground, which emphasis the symbol's legibility. Therefore, the transportation symbol investigation showed that all the participants applied standard pictorial symbols, which can increase comprehensibility.

6.2.3 Are cherry tomatoes sold in this local food shop?

The next question in the graphical variable shapes group asked the participants to put a cherry tomatoes symbol next to the local food shop they indicated on the base map image, using a point symbol with/without graphical variables and labels (see Table 6.1 in Section 6.1 for task 1.4). This task aims to show the local food shop that sells cherry tomatoes.

The first symbol uses three red dots on a green line next to the local food seller symbol indicated in the previous task. It is difficult to explain this symbolisation as conventionally pictorial because it is unlikely to evoke the signified thing, cherry tomatoes, with this representation in users' minds. However, when it is attached to the local food symbol, it may be possible to think it carries information relevant to food (Fig. 6.2, Symbol 1).

The second symbol displays a colourful red tomato above the local food seller symbol, classified as the pictorial one (Fig. 6.2, Symbol 2). The yellow star makes the symbol dynamic and sets the information apart from the ground, increasing its emphasis and legibility. Considering that the background is a map interface full of geographical information, consistency and harmony should be considered.

The third symbol suggested a white information box to give relevant information about the local food shop (Fig. 6.2, Symbol 3). The white box shows the seller's location with the number 1 and provides information about whether it sells cherry tomatoes with a tick mark on the information box. This representation appears as a solution to give detailed information on the maps using different layers.

The fourth symbol shows a pictorial tomato image with a grey background instead of a vector one, so it couldn't be transferred to

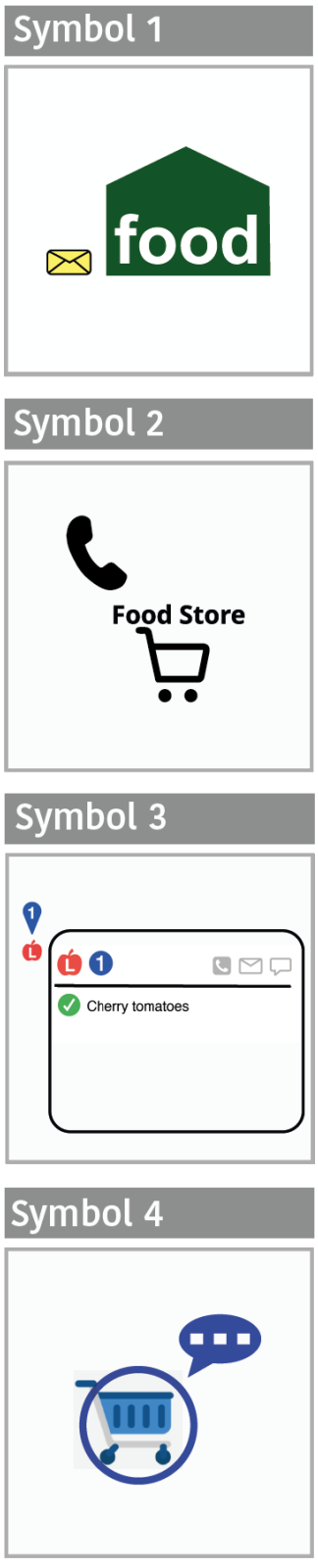


Figure 6.3 Responses from the designers/participants showing different communication methods.

the further stages (Fig. 6.2, Symbol 4 above). An arbitrarily placed grey area does not support the legibility of the symbol in this example but rather could complicate the map interface as an unnecessary graphic element.

Therefore, the outcomes of this task show that participants used both pictorial and geometric symbols to display product information/cherry tomatoes (Symbols 1 and 2 in Fig. 6.2 above). Surprisingly, one participant proposed to work with multiple layers to provide product information (Symbol 3 in Fig. 6.2 above). This proposal can be a good solution able to comprise more than one related piece of information on maps and supporting clarity.

6.2.4 How can I contact the seller?

Consumers at the FMs can ask the seller questions about the products directly (see Sections 5.1 and 5.2 for the observation and survey at FM). This opportunity appears to be a way of reducing concerns about food quality. This question asks the participants to investigate possible communication solutions with the local food shop/seller, drawing a communication symbol, sign, or button (see Table 6.1 in Section 6.1 for task 2.3).

The first symbol, a yellow envelope, draws attention over a monochrome base map by supporting clarity and emphasis in design (Fig. 6.3, Symbol 1). Likewise, a handset in the second symbol, almost as large as the local food symbol, attracts attention at first glance (Fig. 6.3, Symbol 2). The third symbol uses the same information box in the previous task by adding communication methods (Fig. 6.3, Symbol 3). This outcome proposes an information layer use that classifies the information on maps. In this way, giving relevant information in a box (layer) enables the neat addition of three communication alternatives (telephone, email or talking/messaging without directly explicating) to the map. In addition, it facilitates the linking of relevant information together. However, in this example, the symbols' size and colour are not easy to read. The fourth symbol does not make clear which communication method is indicated, and is not vector (Fig. 6.3, Symbol 4).

6.3 Designing consumer-based needs: Spatial Information

The tasks in the spatial information group investigate distance in terms of proximity (see Table 6.1 in Section 6.1 for tasks 1.2, 3.1 and 3.2). In these tasks, the participants mainly explore the hierarchy between two/three distances like close, closer and closest, with a clear order but not quantitatively determined.

6.3.1 Where is the closest local food shop?

The first question in the spatial information group asked the participants to use point/line/area symbols with/without graphical variables and/or labels to show the distance (see Table 6.1 in Section 6.1 for task 1.2).

The outcomes show that the first participant initially combined the point symbol with the size variable to show the closest, closer and close local food shops (Fig. 6.4). In this regard, the point symbol with size variation depicts the hierarchy of distance between three local food shops.

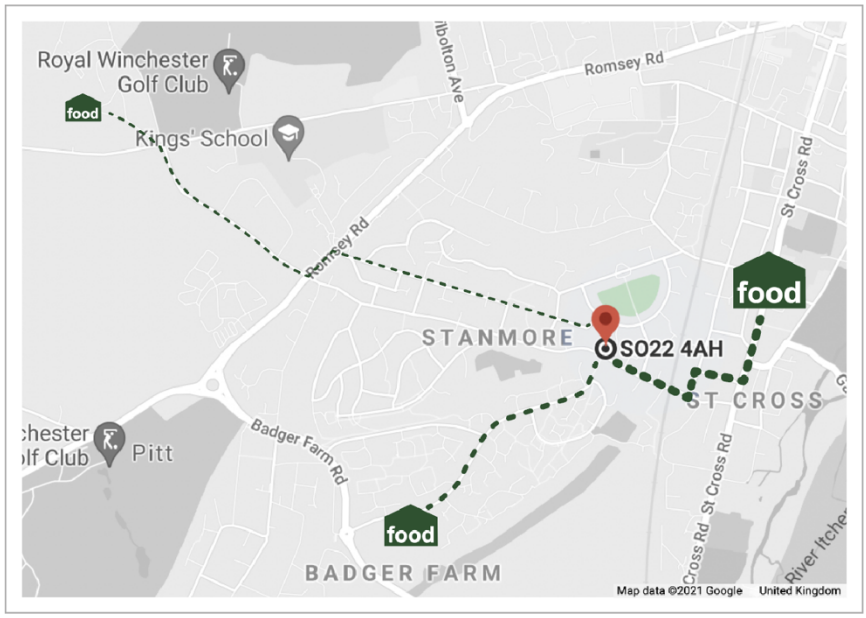


Figure 6.4 The participant's response to the displaying the tasks regarding proximity/distance using the combination of (1) the point symbol with size variable with (2) the line symbol with texture, size and colour variables.

In this example, the largest local food symbol attracts attention visually and makes the closest local food shop selectable by the difference in size between the symbols.

Further, the same participant uses the line symbol by combining texture, size and colour variables to clarify the hierarchy of distances (Fig. 6.4 above). The texture variable is ideal for establishing a visual distinction between informational layers. Both texture and size are 'ordered' and humans are capable of noticing this apparent order at a glance (MacEachren, 1994: 19 & 27). For example, to distinguish rivers from railways, combining line symbols with texture variables works effectively (Monmonier, 1991: 21). In this response, the size, texture and colour on the line symbol differ from the base map lines. The lines on the base map were drawn in white and are solid, but the participant used green colour and dashed lines to show the distances. This use emphasises the path to be displayed. Further, it uses the size variable to explain the distances related to the three symbols. The line to the largest local food shop at the closest distance is the thickest. Thus, the participant considered emphasis, clarity and unity in this example while designing the distances to the three local food shops.

The second participant combined the area symbol with the colour value variable to display the hierarchy between the three local food shops (Fig. 6.5 below). In this example, different colour values of three yellow areas are used as an information layer covering the whole map surface. The colour value can represent the ordinal data as it has an order (MacEachren, 1994, 22). The colour value is assigned to the three circle areas in this example. The larger circle includes the farthest local food shop with the lowest opacity. The participant adjusted the colour opacity to 20 per cent for three area symbols and put the layers on top of each other. In this way, the distance between the closest and farthest local food shops is displayed in value between 20 per cent yellow and 60 per cent yellow.

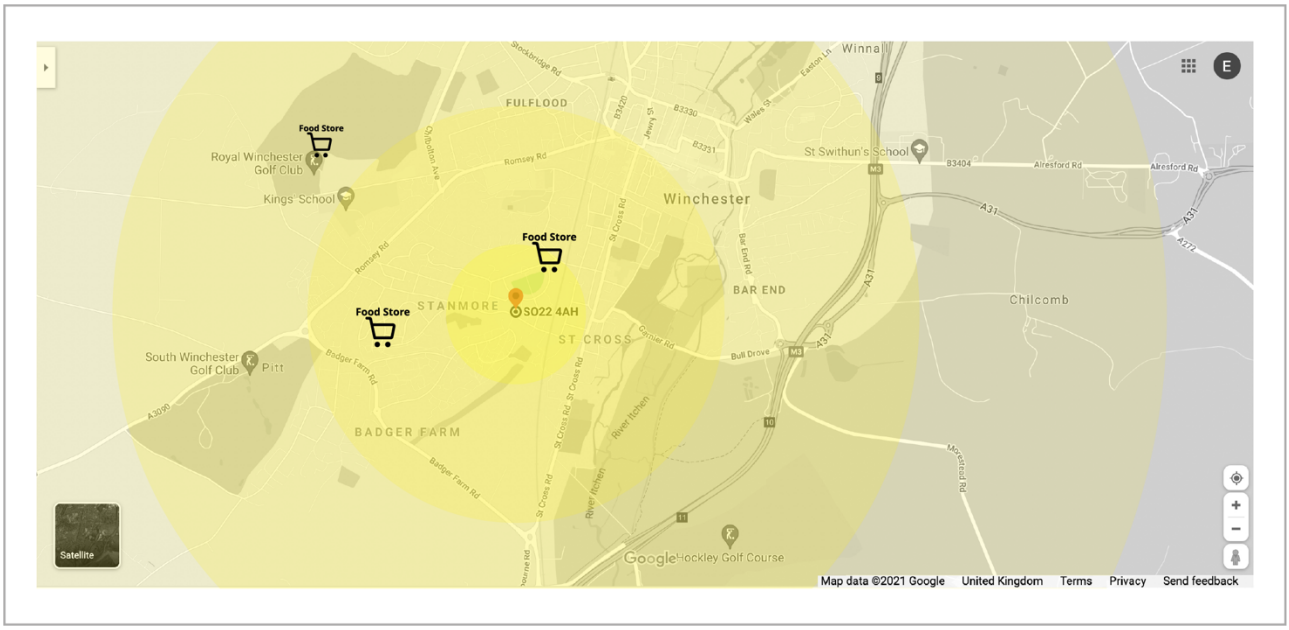


Figure 6.5 The participant's response to displaying the tasks regarding proximity/distance using the combination of the area symbol and the colour value.

The third participant used a point symbol above the local food shop symbols, showing the hierarchy among distances with numbers 1, 2, and 3 (Fig. 6.6). In this example, the numbers are used as pins relating the point symbol with labels. The pins' colour clarifies the information on the monochrome map, and the font size and colour of numbers facilitate the legibility.

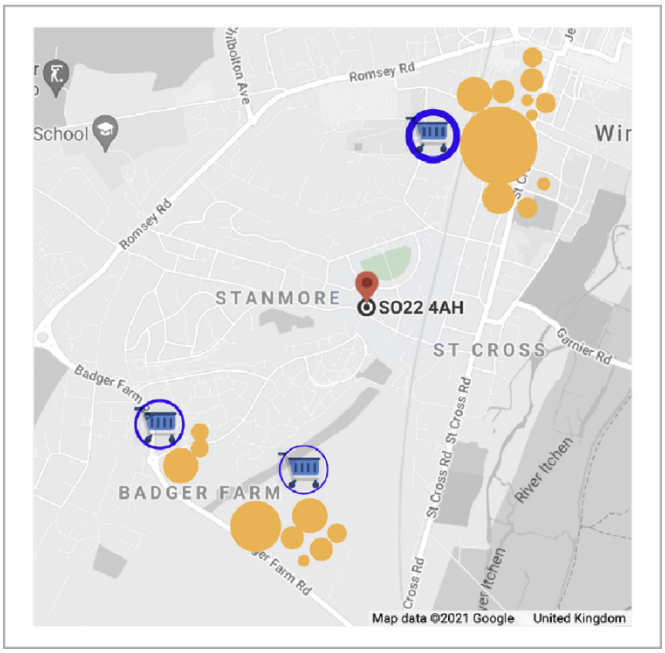


Figure 6.6 Point symbols showing size variable use to represent the proximity of the local food shops.

The last participant used a point symbol near the local food shops (Fig. 6.7). The density and size of the point symbols represent the hierarchy between the different distances, and the most intense symbol displays the closest local food shop. However, arbitrarily placed point symbols cause unnecessary and complex graphic elements to be added to the map interface and create ambiguity.

Figure 6.7 The participant's response to the tasks regarding proximity/distance by using point symbols with numbering.

6.3.2 Where do the cherry tomatoes come from?

The second question in the spatial information group asked the participants to choose three symbol and variable use options to show where the cherry tomatoes come from (see Table 6.1 in Section 6.1 for task 3.1).

The first participant in Symbolisation 1 used a line symbol to show a possible road option between Fareham and Winchester (Fig. 6.8 below). The red-drawn line symbol has a green contour that distinguishes the chosen route from the other routes shown on the base map. Further, the starting and finishing points are displayed in red dots, and the arrow sign shows the destination point, making the route clear (Symbolisation 1, Fig. 6.8 below).

The second participant used an area symbol showing starting and finishing points (Symbolisation 2, Fig. 6.8). Even though it is unclear which semi-transparent pink circle is the starting/finishing point, the user can be clear on the route with the textured arrow and the lorry's direction. However, the participant did not follow any routes shown on the base map. Even if the base map is removed from the background, the information provided can be read without regard to map information.

Figure 6.8 Symbolisations 1, 2, and 3 showing the three participants' responses to task 3.1 in Table 6.1.

The third participant employed an area symbol which does not follow the base map routes (Symbolisation 3, Fig. 6.8 above). The green area drawn between Fareham and Winchester has a slight implication with a darker colour.

The fourth participant combined an area and line symbol (Symbolisation 4, Fig. 6.9). The semi-transparent yellow area indicates a broader area not asked for in Task 3.1, but includes the distance between Fareham and Winchester. The red line symbol does not follow any routes on the base map but links these two points to each other, and the red point on Winchester is unclear for indicating which are starting and finishing points.

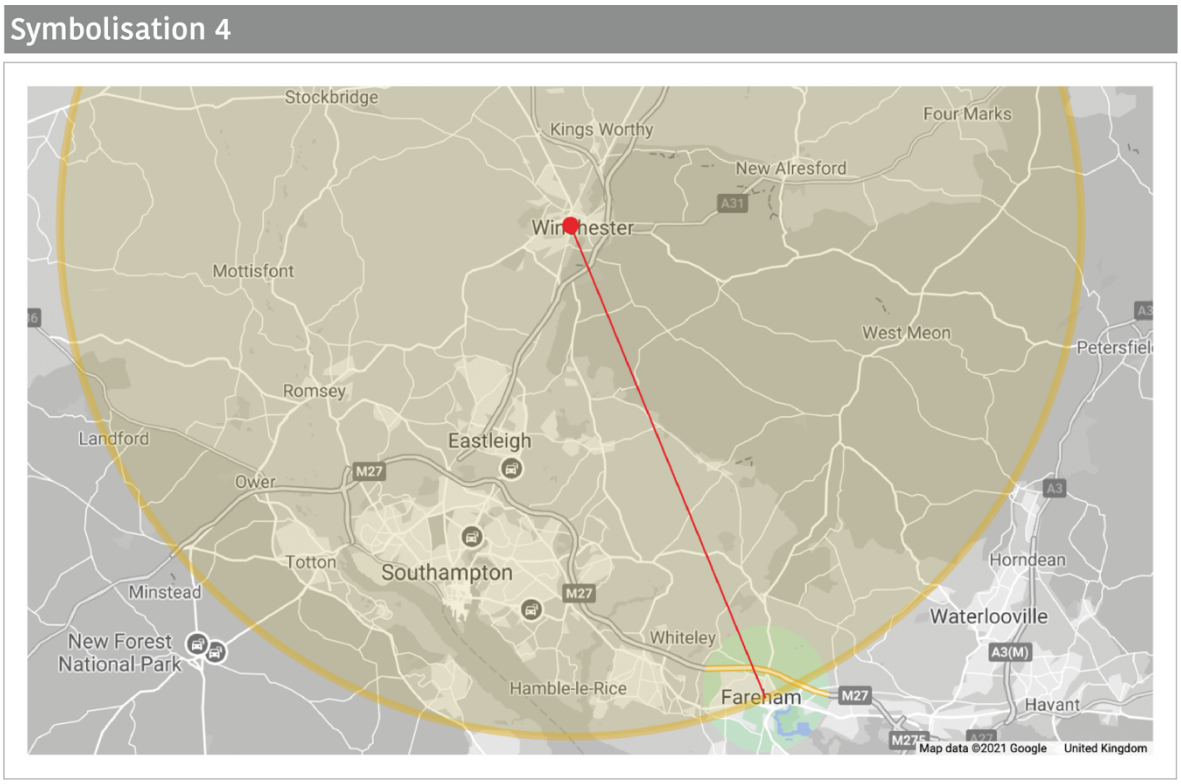


Figure 6.9 Symbolisation showing the fourth participant's response to task 3.1 in Table 6.1.

6.3.3 Which route releases higher CO_2 emissions?

The third question in the spatial information group asked the participants to show the higher CO_2 emissions for two routes using symbols and variables (see Table 6.1 in Section 6.1 for task 3.2).

In this task, all the participants were asked to use the same base map used in task 3.1 to carry out this task. The first participant added point symbols in different sizes on the line symbol drawn in task 3.1 and put a breakpoint in Eastleigh (Symbolisation 1, Fig. 6.10).

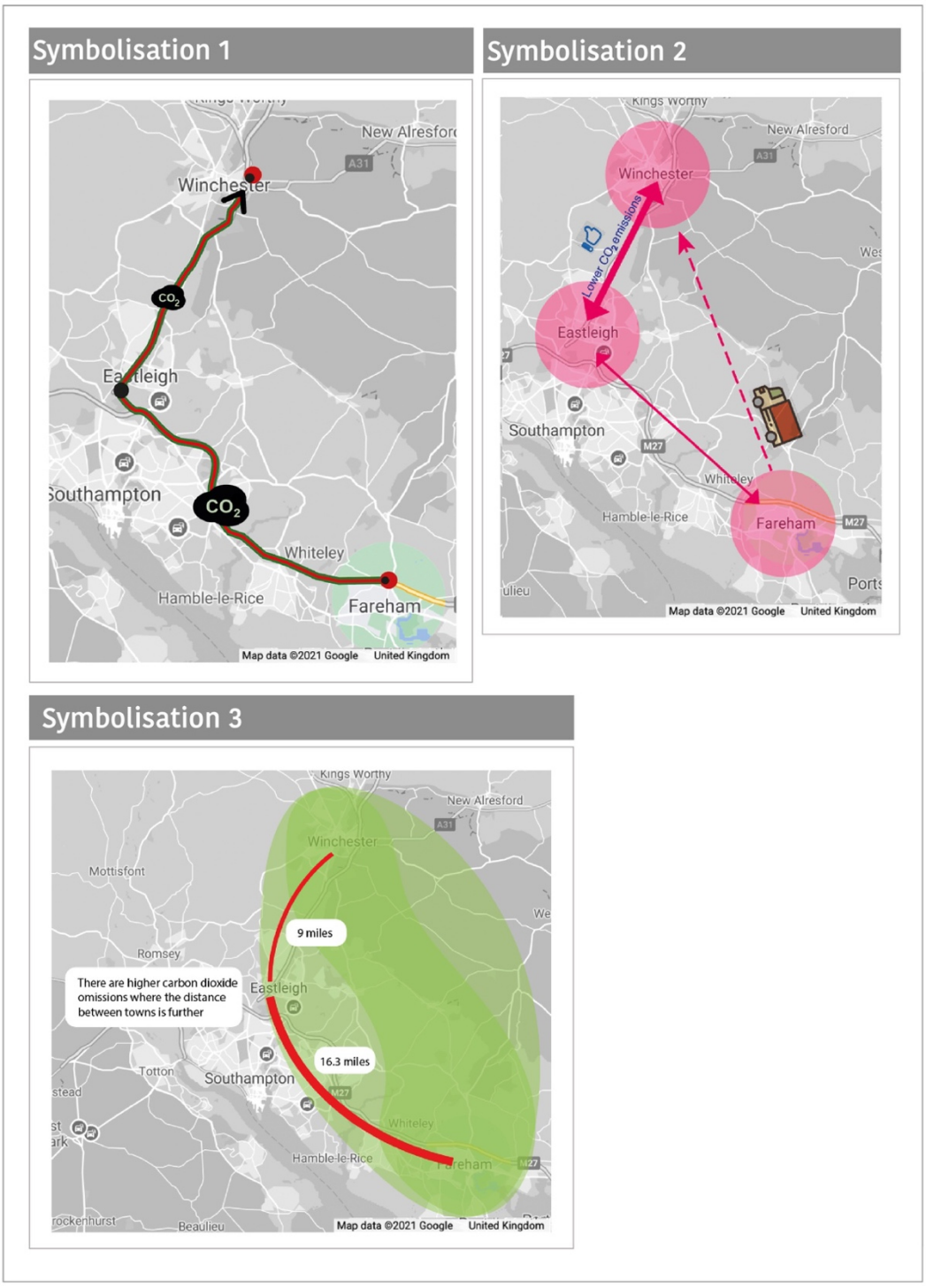


Figure 6.10 Symbolisations 1, 2, and 3 showing the three participants' different responses to task 3.2 in Table 6.1.

The farther route, between Fareham and Eastleigh, was indicated by a larger symbol – a larger CO_2 label. When comparing these two distances, the size variable used in the CO_2 symbol clarifies the information. Further, the symbol's shape and colour are linked to CO_2 emissions and resemble a dirty release in black. The white–black contrast also makes the symbol legible.

The second participant added one more area symbol or indication on Eastleigh by continuing task 3.1 (Symbolisation 2, Fig. 6.10 above). The different sizes of arrows showing different directions between three areas can lead to ambiguity or give wrong information in this example. For example, the medium dashed arrow displays one direction from Fareham to Winchester. Is this only one direction? What does the dashed arrow mean? Why is the lorry from the previous task still on the road? Does the dashed arrow represent a block on the road? On the other hand, the representation, the phrase 'Lower CO_2 emissions', and the thumbs-up symbol above the thickest arrow between Eastleigh and Winchester can help the users get information about CO_2 emissions.

The third participant responded to this task by using labels and opening an extra information box (Symbolisation 3, Fig. 6.10 above). The thicker side of the red curve gives the higher CO_2 emissions information. Even though the white information box was not opened, the miles labels help indicate the information in this example. Due to repetition, unnecessary information text covered the interface in this example.

The fourth participant in Symbolisation 4 drew a triangle between three places, which can offer an immediate insight into which distance releases the higher amount of CO_2 (Fig. 6.11 below). Further, the information boxes added around the triangles display the amount of CO_2 emissions. The notable contribution is adding a legend to the corner of the map in this example. The explanation box/legend on the left makes the information about CO_2 emissions precise. This representation is obviously based on the need to design information clearly and recalls legends used in cartography.

Symbolisation 4

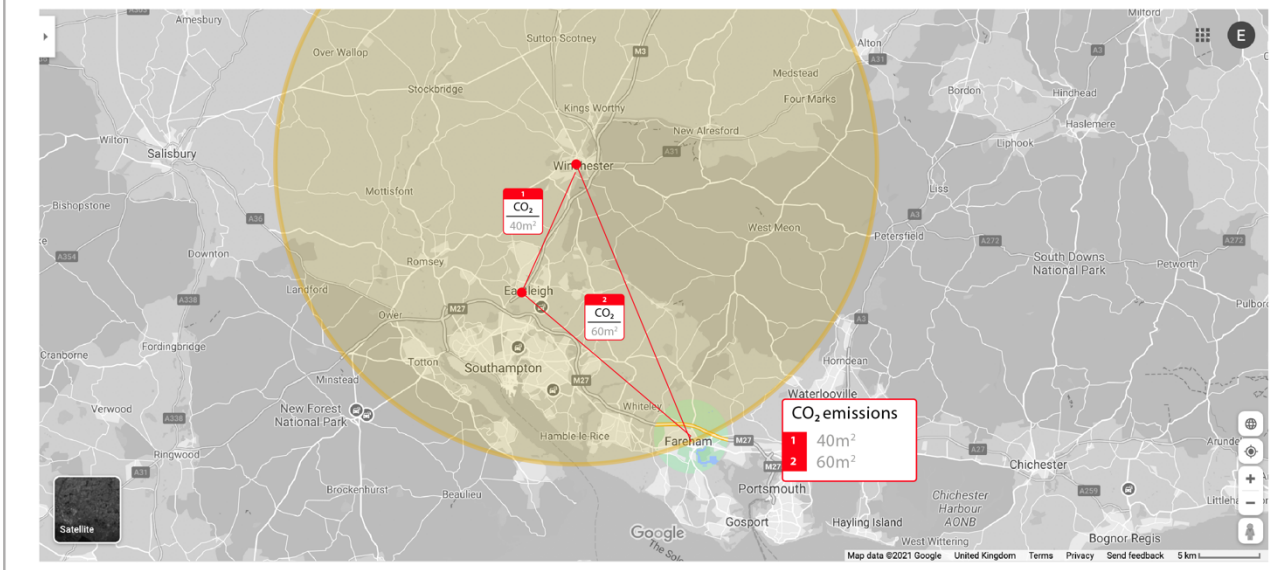


Figure 6.11 Symbolisation showing the fourth participant's response to task 3.2 in Table 6.1.

6.4 Designing consumer-based needs: Detailed Product Information

The second part of the consumer-based user scenario asks the participants to show detailed information about food on the map (see Table 6.1 in Section 6.1 for tasks 2.1 and 2.2). These tasks do not direct them to draw a symbol using variables and labels; conversely, they are given free rein on how to show detailed information about the products on the map interface.

6.4.1 How can I see others' comments?

This research proposes that a way of getting an idea about the food quality is to see other customers' comments. That is because both consumers and sellers are in contact with each other regarding food quality (see Section 5.2.3 for the survey outcomes). In this regard, task 2.1 in Table 6.1 asks participants to show the given example of the comment around the cherry tomatoes symbol indicated in task 1.4.

The first two participants in Symbolisations 1 and 2 used a speech bubble to show the quality of the cherry tomatoes with the given comment, 'The taste and freshness are excellent! I loved it!' (Fig. 6.12). Both participants paid attention to the colour code they used in their general design approaches and followed the type style (Arial and Myriad Pro) but in different type forms (italic and regular). The comment shown in Symbolisation 2 is more readable than in Symbolisation 1.

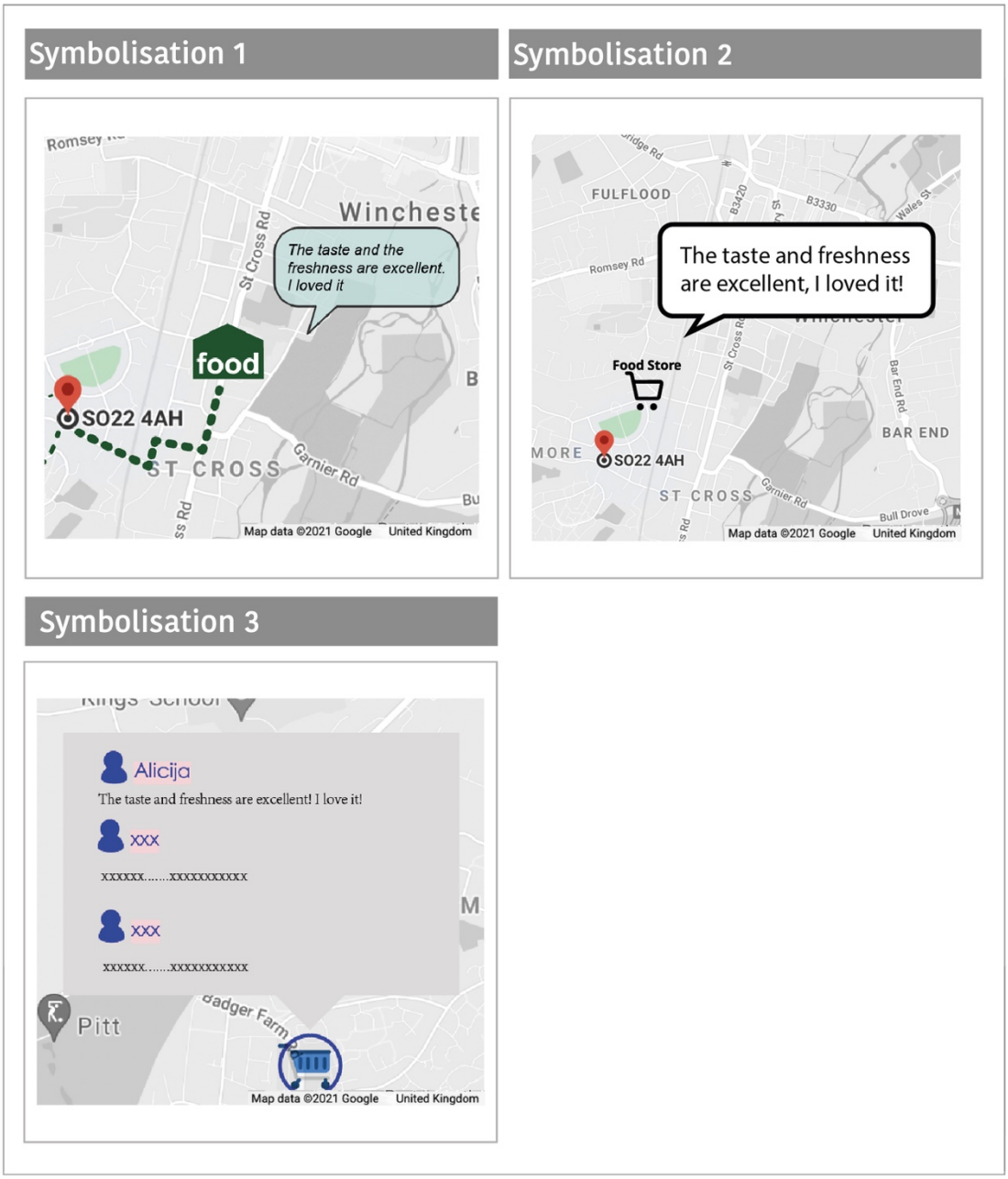


Figure 6.12 Comments from other customers providing information about the quality of the cherry tomatoes.

The third participant in Symbolisation 3 used a comment box which includes more than one customer comment, with a user profile picture symbol and user names instead of showing only one comment (Fig. 6.12 above). This example illustrates a grey box that is difficult to distinguish from the map's background and occupies a considerable amount of space. Comments are also difficult to read because of the font size and colour used.

The participant in Symbolisation 4, who used the opened information box in task 1.4, continued with the same box by adding detailed product information (Fig. 6.13). The comment on the cherry tomatoes sold in the local shop marked with the number 1 was placed into this information box. However, the font used for the comment makes reading difficult.

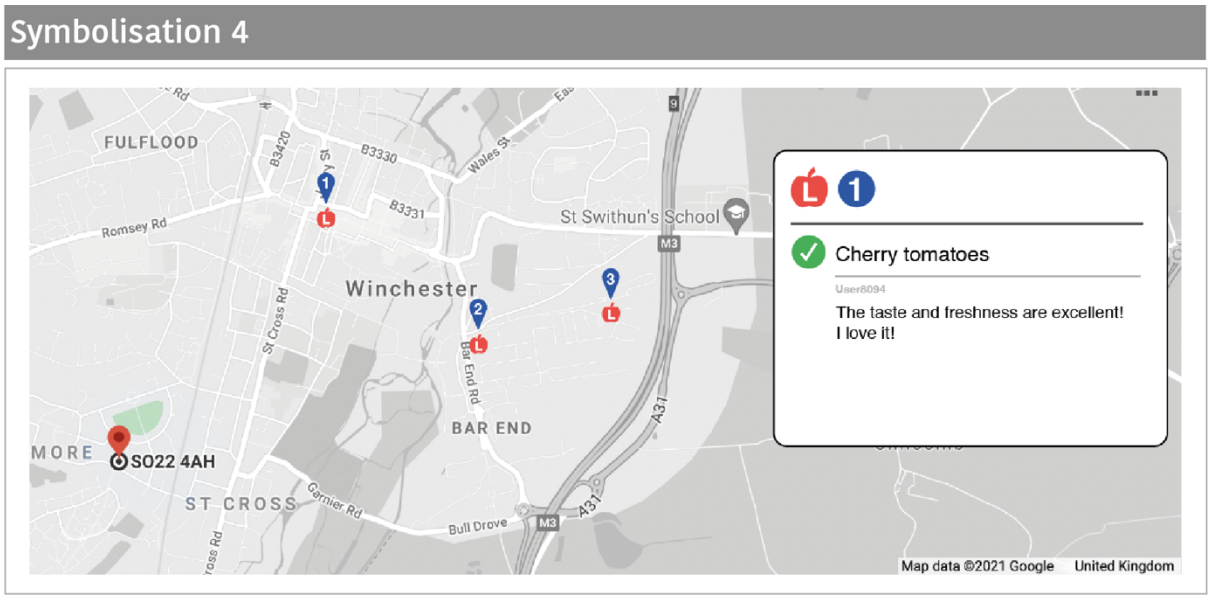


Figure 6.13 Comments from other customers providing information in a box about the quality of the cherry tomatoes.

6.4.2 How much is this tomato?

Task 2.2 in Table 6.1 in Section 6.1 asks participants to show the price of the cherry tomatoes near cherry tomatoes symbols. The first two participants in Symbolisations 1 and 2 in Figure 6.14 showed the prices by editing the example of '1.5 kilos of cherry tomatoes are £11.50!' at the corner of the speech bubble created in task 2.1.

The first participant in Symbolisation 1 placed the price information in red circles, which can increase the legibility of the price. The colour hue also links the price to the cherry tomato symbol in this example, as both are in the same red. However, the small label size reduces the readability in this example.

The first two participants in Symbolisation 1 and 2 followed the same type style (Arial and Myriad Pro) as task 1.1 but in different sizes (see Fig. 6.14).

Figure 6.14 Different presentation styles showing price and customer comments together.

When the first and second symbolisations are compared, it can be said that the second symbolisation has better readability with the black-and-white contrast and the use of larger labels.

The third participant in Symbolisation 3 used the same box as in task 2.1 and moved the tomato symbol next to the price information (Fig. 6.14 above). In this example, different kinds of information are placed into the same box, and the price of cherry tomatoes, one of the most critical pieces of information consumers want to see, is hidden in the comment box. This use will cause classification problems in the presentation of information, as well as a readability problem due to the small size of text used.

The fourth participant in Symbolisation 4, who used the opened white information box in task 1.4, added the price information in the same box (Fig. 6.15). Although the relevant information seems to be ordered in this example, this use poses two problems with legibility: (1) perception of the contrast between the message and background, and (2) a type size that is too small. In this regard, the message and the price information are unintentionally hidden, as in the example of the third participant.

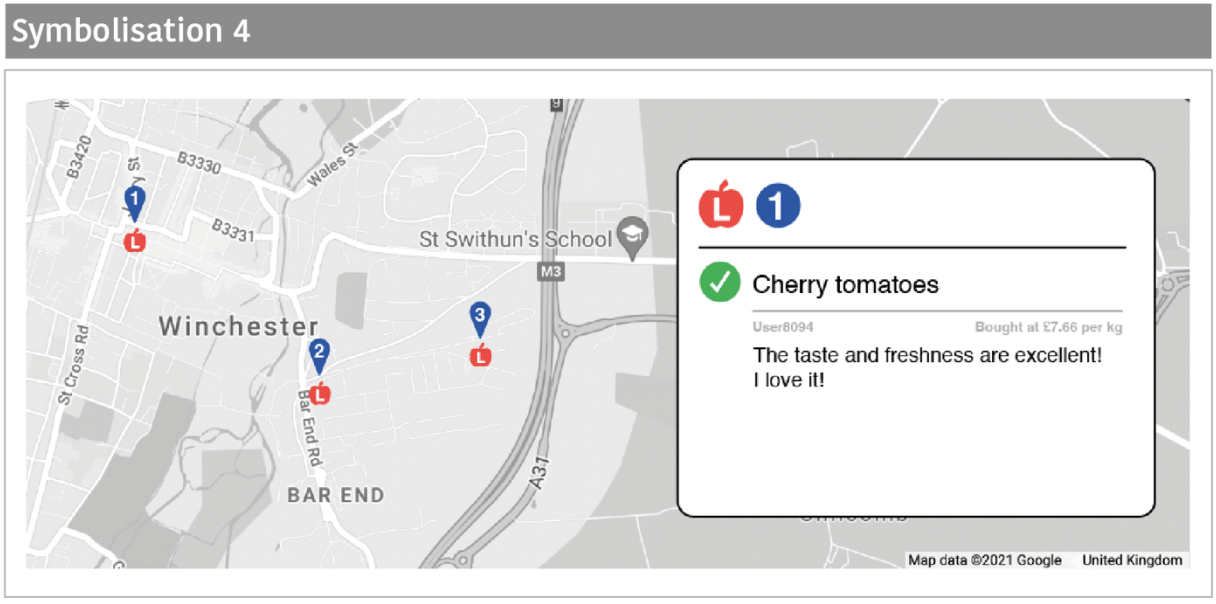


Figure 6.15 The white box including price and customer comments together.

6.5 Designing vendor-based needs: Graphical Variable Shapes

Vendor-based tasks seek answers to four interrelated questions, classified using the Graphical Variable Shapes: (1) Where is Rob's farm? (2) Is there any other shop that sells Rob's farm products? (3) Which delivery options does Rob's farm/the shop selling Rob's products have? (4) Does this farm have a car park option? (see Table 6.2 in Section 6.1 for more details on the vendor-based user tasks).

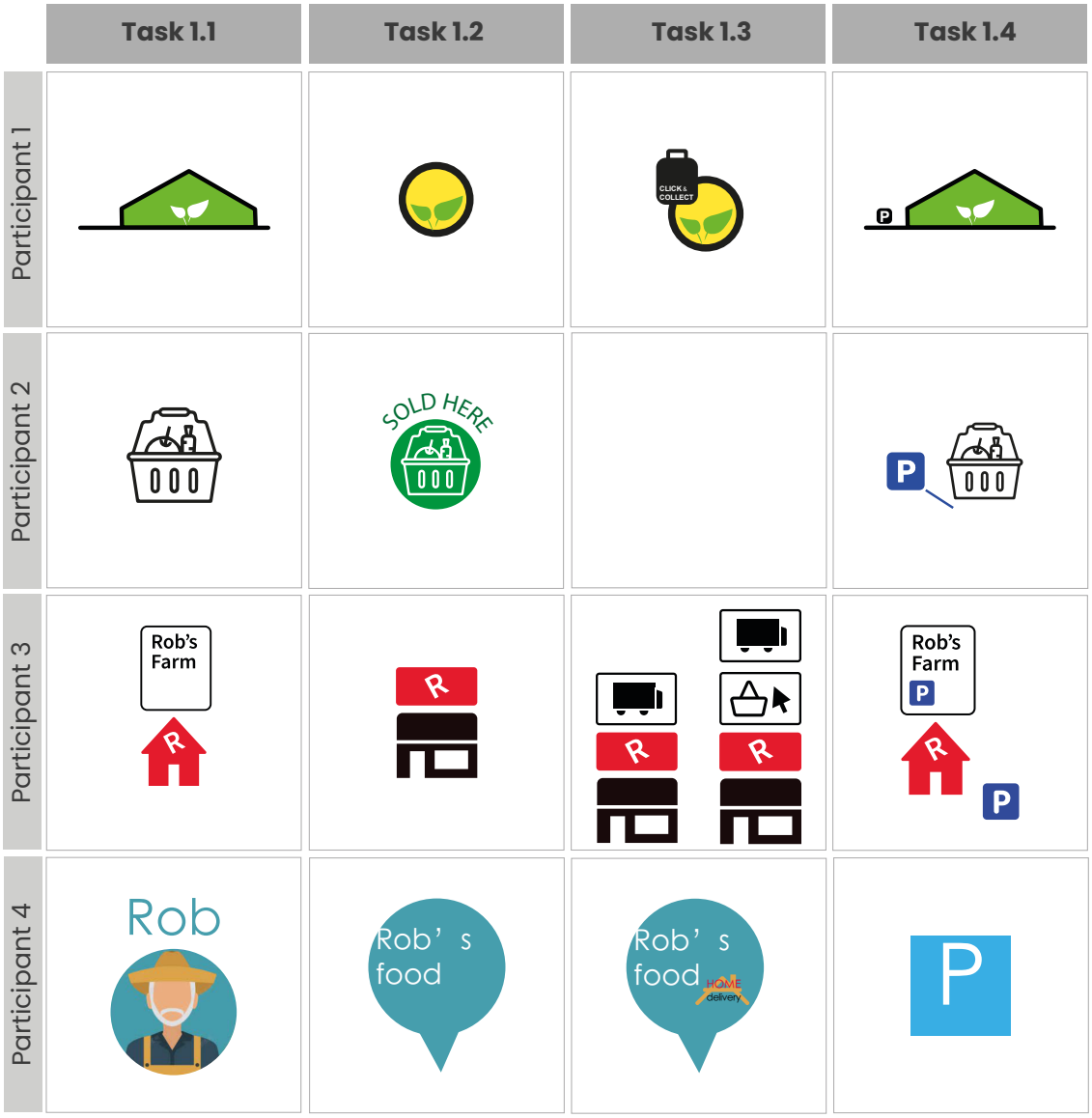


Figure 6.16 Table showing the designers' responses to the vendor-based user tasks in Table 6.2.

The first participant, who designed a more abstract representation to show a local food shop in the consumer-based tasks (see Table 6.3 in Section 6.1), followed a similar representation style to show Rob's farm in Figure 6.16. In the vendor-based tasks, the farm is depicted with a wider symbol evoking a barn with a leaf graphic on it, and the leaf becomes the carrier of the identity in the following vendor-based task (see Fig. 6.16 above for results of tasks 1.1, 1.2, 1.3 and 1.4). In task 1.2, the same participant uses a black-outlined yellow circle as a landmark to show the other sellers that sell Rob's products. The black-outlined symbol in this example increases the visibility. The same landmark in task 1.3 uses a black bag labelled 'click and collect' to show the delivery options. However, the black bag is not evocative of delivery options. Further, the 'click and collect' label is not very readable. Even though the white label is used on a black background, the label size makes it almost impossible to read. In task 1.4, the same participant placed an orthodox park symbol next to the landmark showing Rob's farm (Fig. 6.16 above). However, the car park symbol is not legible because of its size.

The second participant drew a box of full vegetables to show Rob's farm on the map (Fig. 6.16 above). This symbol can be classified as pictorial/mimetic but is not directly related to a farm location but rather shopping. The identity is moved to task 1.2, adding a green background and a 'SOLD HERE' label. The 'SOLD HERE' label is readable in capital letters. However, placing it directly over the map requires re-examining the consistency and unity of the interface. The second participant skipped Task 1.3 and used an international standard car park symbol with a white-coloured 'P' symbol over a blue square in task 1.4 (Fig. 6.16 above). The parking symbol is legible and proportional to the farm symbol.

The third participant used the red house symbol with an 'R' letter and another small white label with 'Rob's farm' written on it in task 1.1 (Fig. 6.16 above). In this example, the red house symbol evokes a barn or house rather than a farm. The 'R' letter on the house pictogram may not have the intended meaning without the label stating 'Rob's farm' or the 'Rob's farm' rectangular label may not need the red barn as the label already clarifies the signified thing. More importantly, this combination covers a large area on the map interface by using unnecessary information. Further, the

same participant created a kind of 'lifter' which conveyed the identity of Rob's farm with a red rectangle and an 'R' letter on it (Fig. 6.16 above, task 1.2). However, the 'lifter' does not have a meaning or relation to the context/task and is likely to bring ambiguity. The same lifter is also used to display alternative delivery options in task 1.3. In task 1.4., the participant used a conventional/international car park symbol twice, both on the white label and near the red barn. Thus, in tasks 1.1 and 1.4, the same participant repeated information and used unnecessary graphics/labels (Fig. 6.16 above).

The fourth participant illustrated a farmer wearing farmer overalls and a hat. The farmer's name was written as Rob in the illustration (see Fig. 6.16 above for task 1.1). This symbol shows that this location belongs to a farm or Rob's farm shop, and the farmer is directly associated with local food. However, this symbol is an image, so it cannot be tested in further stages of this research. The participant responded to tasks 1.2 and 1.3, by drawing what looks like a speech bubble. However, both used white colour text, which reduces the legibility. In task 1.3, a home symbol indicated the delivery option with a 'home delivery' label. However, the home symbol is not clear and it is hard to interpret the meaning. Task 1.4 shows the car park facility with a 'P' letter, but the 'P' and light blue background were not appropriately adjusted. The participant did not follow any colour code previously used for the related tasks in this example.

6.6 Discussion of the visualisation workshop

The visualisation workshop in this research employs maps as information design materials and asks the information design practitioners to employ their design knowledge using base maps. This workshop draws attention to the design concerns of making the message more straightforward for users in design practice.

The workshop tasks focus on a local food landmark catalogue, including the local food shop symbol, farm shop, delivery options, travel symbol, cherry tomato symbol, and communication symbol. The outcomes from graphic variable shape tasks have shown that:

(1) Designers use a pictorial/mimetic symbol rather than geometric/abstract.

However, some symbols are likely to be evocatively weak. For instance, even though local food shop symbols refer to a local food shop idea, they focus more on the idea of food or the supermarket (Table 6.3). Likewise, a food basket can be ambiguous for displaying a farm shop (see Fig. 6.16 for the response of Participant 2 to task 1.1).

(2) Designers use labels to clarify/support the meaning/message.

Elias and Paelke (2008) stress that word use can be necessary if the symbol is not a direct graphic representation of the shop type. Some examples combine labels and symbols to increase comprehensibility (see Table 6.3 for the responses of Participant 1 and 2, and Fig. 6.16 for the responses of Participant 2 in Task 1.2). The labels are used as an empowering graphic element that evokes the idea of local food. This way, users may find what they are looking for much more easily.

(3) Designers consider legibility by choosing standard typefaces on maps such as Arial and Myriad Pro, classified as sans serif fonts (type style) and using other type attributes (see Fig. 6.16 for the response of Participant 3 in tasks 1.3 and 1.4).

Labels on maps are also critical component working with both symbols and on their own. Legibility is improved by selecting common typefaces in creating a typographic layout (see Section 2.4.2.3 in Chapter 2 for more details on labels). Likewise, classifying the information with type size, type style and colour makes information more legible. However, the type size in some examples might be too small in different

scales and thus reduce the readability (see Fig. 6.16 for the response of Participant 1 in tasks 1.3 and 1.4).

(4) Designers improve legibility by applying high contrast between the text and its background.

For instance, one participant placed the white 'FOOD' label in the centre of the green symbol, separating the local food shop symbol from the base map/background (see Table 6.3 for the response of Participant 1). This placement considers both type attributes and visual contrast that affect legibility on maps. However, for example, placing the label 'Food Store' over the symbol and directly on the map base is likely to visually confuse as there is no background/outline to separate it from the base map features (see Table 6.3 for the response of Participant 2).

(5) Designers use standard/pictorial travel and car park symbols which are connotatively stronger (see Fig. 6.1, and Fig. 6.16 for the responses of Participants in Task 1.4).

Additionally, one participant added a background for the travel symbols (see Fig. 6.1, Symbol 2). This preference can promote clarity and help to perceive the symbol easily on maps.

(6) Designers use different abstraction levels in symbol design.

The representation of the cherry tomato brings both pictorial/mimetic and geometric/abstract symbolisation (see Fig. 6.2). While Participant 1 drew red dots to display cherry tomatoes, Participant 2 preferred to draw a pictorial symbol (see Fig. 6.2 for Symbols 1 and 2). Even though the abstraction level of symbols is the designers' choice, in comparing abstract symbols with pictorial ones, users usually need to learn the meaning of abstract symbols (see Section 2.4.2 in Chapter 2 for more details on the use of

symbols, graphical variables and labels). In this regard, the first participant who drew red dots to display cherry tomatoes expected the user to discover and learn the meaning of red dots.

(7) Designers aim to provide unity and harmony in designing the related tasks.

As the consumer-based tasks focus on different research points, designers also explored proximity or the display of user comments in these tasks (see Table 6.1 for the consumer-based tasks). When the consumer and vendor workshop outcomes are compared, it can be said that the designers felt more comfortable establishing relationships between the vendor-based tasks since the vendor-based tasks remained within the landmark research only (see Table 6.2 for the vendor-based tasks).

(8) Designers consider the corporate identity while designing related tasks (see Fig. 6.16)

The identity of Rob's farm moved to all associated tasks when designing the vendor-based tasks in Figure 6.16. This approach adapts the design elements a seller needs into the map interface, considering the context within the design. In this way, a vendor can show his farm, other shops selling his products, different delivery options and car park options in the map interface by associating it with his corporate identity.

(9) Designers use conventional symbols for car parking and delivery options instead of designing from scratch in vendor-based tasks (Fig. 6.16, tasks 1.3 and 1.4). This result may indicate no need to re-invent conventional symbols.

The questions in the group of detailed information tasks asked the participants to discover daily information that users want to find out about local food on a map interface (see Table 6.1, tasks 2.2 and 2.3). These tasks adapt daily information to the map interface,

creating a new discovery area for designers. The outcomes have shown that:

(1) Designers suggested two representation methods for this discovery: (a) placing the user comment or price information next to the relevant area and on the base map directly (see Figs 6.12 and 6.14, Symbolisations 1 and 2), and (b) opening an external white layer and displaying all associated information within the box, independent of the base map (Figs 6.13 and 6.15, Symbolisation 4).

In (b), information added in successive tasks was associated together in the design, allowing the designer to present the detailed information without breaking the user's relationship with the base map (Figs 6.13 and 6.15, Symbolisation 4).

(2) Designers suggested pop-up speech bubbles or boxes to the map interface for practical information other than map information, such as showing user comments about the product or price information (see Figs 6.12 and 6.14, Symbolisations 1 and 2).

The questions in the spatial information group asked the participants to use point/line/area symbols with/without graphical variables and/or labels to show proximity or distance (see Table 6.1 for tasks 1.2, 3.1 and 3.2). The designers are expected to apply their experience in using maps and their design knowledge while carrying out these tasks. The workshop outcomes show that participants applied cartographic conventions given as a brief before the workshop while deploying their design knowledge (see **Appendix 3.A**).

Designers displayed information about the hierarchy of the distances using:

(1) Point symbol with the size variable (Fig. 6.4).

(2) Texture, size and colour variables (Fig. 6.4).

(3) Area symbol with a colour hue variable (Fig. 6.5).

(4) Point symbol with the size feature (Fig. 6.6).

(5) The semi-transparent area symbol with a line symbol (Fig. 6.9)

As a result, this thesis acknowledges that symbols are the carrier of information as particular graphics on maps (Boersema & Adams, 2017: 305). Symbols allow a message to be presented more concisely (Boersema & Adams, 2017: 305). In order to achieve this, this thesis collaborated with information designers in the visualisation process while designing the interface elements needed by the target user group. Designers focused on the structure of the graphical messages as a part of the functionality of design and how to use map symbols with graphic variables and labels. However, the evidence that establishing a single symbol standard for maps is impossible can be clearly seen in the workshop outcomes. Thus, the methods suggested by information design promote involving users in the evaluation stage to create a well-designed product in the following step (see Section 2.3.1 for more details on design practice). This research needs user feedback in this stage to create a complete picture of a user-friendly food map. Thus, in the following stage, the workshop outcomes are tested by collaborating with local food stakeholders to evaluate the functionality and usability of the interface elements.

7 Usability testing

The specific objective of this chapter is to determine the usability of the local food map interface elements. Stahl-Timmis (2017: 456) notes that one of the metrics to evaluate a visualisation design is to gain insight from the users looking at the design. That is because the designer's model and the user's model often differ significantly, even when it comes to a simple design product, like a symbol sign (Adams, 1998). This research draws attention to stakeholder involvement throughout the design cycle and decides the usability of the local food maps from the point of their view. A usability walkthrough was employed, where the target users carried out tasks based on user scenarios. The prototype developed for the usability test focused on user tasks that investigated the usability of the selected symbols, variables and labels for local food maps tailored to consumers' and vendors' needs. The following sections discuss the principal findings of the usability test conducted with actual local food map stakeholders. In particular, it focuses on whether local food map stakeholders easily interpret the symbols, variables and labels provided and how they react to the information.

For the usability testing, local food stakeholders were recruited from the three counties forming the study area — Hampshire, Berkshire and Oxfordshire— by sending an online test link. The aim was to involve locals who are interested in local or fresh food in the evaluation of the usability of the local food map. Firstly, the thirteen-local people in my survey at FMs who provided their contact details for further research on the developing system were invited to the usability testing stage (see Section 5.2 for more details on the participants at FMs who agreed to further involvement). In order to involve rural-related people, the link was then passed to the Museum of English Rural Life to be tested by the museum's volunteers. Lastly, the test link was shared with other local stakeholders: Reading UK Facebook Group, East Reading Community Group, and Newtown Residence Group. The link to the test was made available for three weeks for participants to take part at any time during that period. Depending on their availability, participants were asked to do the

test in their own environment using their own laptop/desktop devices.

The testing system comprises four main technical components: Mapbox Studio, front-end development, back-end development and database. The map prototypes are designed in Mapbox Studio using map data from Mapbox and OpenStreetMap and their data sources[1]. In the front end, these maps are displayed to users and questions are asked through a web browser such as Firefox, Chrome, Safari or Microsoft Edge. In the back end, the answers are stored in the database. The back end also controls the logic to progress to the next question. The database keeps all the answers given by all the users taking part in the study. Once the tests are complete, the collected data is transferred from the database to an Excel file.

The test begins by asking the participants to submit information about their user group (consumer or vendor) and age range (see **Appendix 4** for the usability testing screenshots). In total, 65 participants were involved in the usability test. The age distribution options are divided into four breakpoints. Figure 7.1 shows how many people from each age group participated in the usability test. All the participants who were involved in the test were consumers.

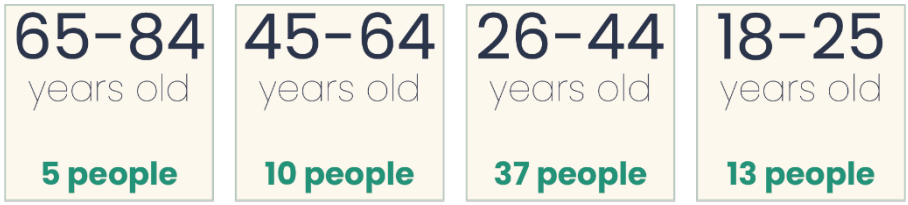


Figure 7.1 Number of participants recruited for the usability test and their age distribution.

The tasks are based on the range of consumers' and vendors' needs that would be considered while making decisions about the user experience of a local food map. In this regard, the usability test employs the outcomes of the visualisation workshop in two separate parts. The tasks in the first part examine the consumers' needs, and the second part explores the vendors' needs. The tasks

[1] To learn more, visit https://www.mapbox.com/about/maps/ and http://www.openstreetmap.org/copyright.

focus on the three investigation points in map design; (1) graphical variable shapes: pictorial/mimetic or geometric/abstract, (2) spatial information (geographical proximity), and (3) detailed product information (see Section 5.3 for more details on the investigation points). Each screen in the test shows a map parallel to the maps used in the visualisation workshop (see **Appendix 4**). The maps include the map symbols, variables and labels derived from the workshop. The participants answered the questions by clicking the button of their choice on the page. Users were free to skip any question they wanted, so even though the total number of participants was sixty-five, not all participants answered every question.

7.1 Research into local food map symbols

This research transfers the interface elements designed in the visualisation workshop to a usability test to evaluate their usability with the local food stakeholders. However, not all the outcomes from the workshop are carried over to the usability testing. The design practice of this research focuses on specific points following the questions asked in Section 3.4. In this regard, visualisation workshop tasks focused on the following issues, considering the design criteria:

(1) Avoiding unnecessary symbols and labels;

(2) Using simple, understandable, and readable symbols;

(3) Testing both pictorial/mimetic and geometric/abstract symbol use;

(4) Presenting a new symbol in a way that users can easily interpret without having to learn it;

(5) Avoiding clutter in the map interface by considering corporate identity studies for providing relevant and detailed information about local food shops;

(6) Considering the simplicity and clarity of using graphical variables when answering questions about distance;

(7) Considering the legibility and readability of typefaces using font, format, size, spacing, and colour, which have become indispensable for symbols and labels.

Further, the workshop outcomes that suggested working with multiple layers could not be transferred to usability testing as the testing prototype work with only one-layer maps. Other results not transferred to the usability testing were not designed as vectors.

The usability testing follows the same user scenarios investigated in the visualisation workshop. The developed prototype consists of two parts fed from user scenarios as consumer- and vendor-based tasks. The following tasks employed Barbara and Tom's story as a consumer-based user scenario; the second used Rob's as a vendor-based user scenario (see Tables 6.1 and 6.2 for the short versions of the user scenarios investigated in the visualisation workshop).

7.2 Analysis of consumer-based usability testing outcomes

The first section begins by analysing a consumer-based task based on Barbara and Tom's story. It focuses on graphic variable shapes called 'landmarks' on maps, and this focus reveals the local food map users' symbol preference on a prospective local food map.

7.2.1 What symbol do you find most appropriate to show a local food shop?

The first question asked the participants to choose the most appropriate symbol showing the local food shop on the base map (see **Appendix 4** for the usability test screenshots). Symbol 2 in Figure 7.2 below among the options was derived from the visualisation workshop and directly transferred to the usability test to understand the usability of an abstract symbol. However, some symbols obtained from the workshop have been rearranged or are not included in the usability test. For instance, Symbol 4, derived from the workshop, was reformed before being transferred to the test (Fig. 7.2 below). The reason is that the

legibility of the symbols is affected by the figure–ground relation. In this example, Symbol 4 was placed in a background to ensure good readability on the map in the context of the figure–ground relation. Further, two symbols designed by the designers were not used in the usability testing because one was not a vector (Symbol 3), and the reason for not using the other (Symbol 1) was it was not evocative; instead the test aimed to record the reaction of the users when a more evocative/pictorial symbol was used. One of the investigation points of this research is to determine whether users can easily interpret pictorial symbols. As mentioned in the literature review, pictorial symbols are simple to recognise and do not need a graphical interpretation (Elias & Paelke, 2008). While a higher-level abstract symbol is tested with Symbol 2, Symbols 5 and 6 were created to evaluate a pictorial one (Fig. 7.2). Symbols 5 and 6 were designed from scratch as pictorial symbols for the usability test by the author.

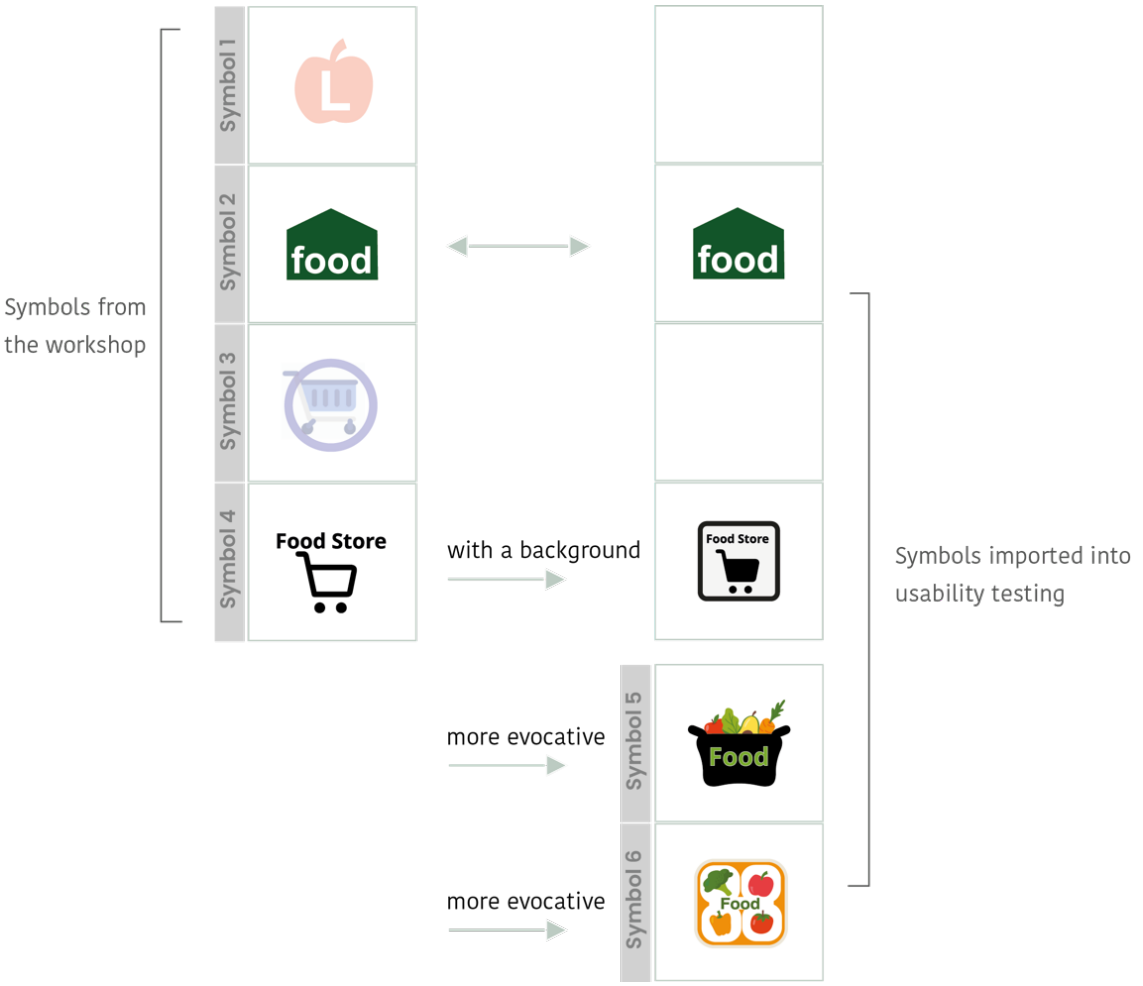


Figure 7.2 Local food symbols designed in the visualisation workshop and those included and rearranged in the usability testing.

The data in the usability testing has been gathered across different age groups, as there may be various usability issues for different age groups. The outcomes showed that *sixty-three participants out of sixty-five* responded to this first question by choosing one of the four symbols shown on the base map, and two skipped this question. The outcomes showed that pictorial and associative symbols are the most chosen (see Table 7.1, Symbols 1 and 3). In total, Symbol 3 was chosen by thirty-one out of sixty- five participants, while seventeen participants chose Symbol 1.

Table 7.1 Local food symbol selection by number of participants and age group.

		18-25 years old	26-44 years old	45-64 years old	65-84 years old	Total number of respondents
Symbol 1		2	11	4		17
Symbol 2		3	3	1		7
Symbol 3		3	20	3	5	31
Symbol 4		4	4	1		7

However, the 26–44 age group participants, which comprises the majority of the participants, are dominant in the test results. In this age group, the total number of choices for the other three symbols and the number of choices for Symbol 3 are almost the same (Table 7.1). The second most chosen symbol for the 26–44 age group is Symbol 1. For the 65–84 age group, Symbol 3 is the only choice, having been selected by all participants, but the number of participants in the 65–84 age group is quite low. A more homogeneous distribution is seen in the choice of symbols

for the 18–25 age group. Although the 45–64 age group participants mainly chose Symbol 1, Symbol 3 may also confuse them. Therefore, the number of participants, which is not equally distributed, is a major factor in not having a precise outcome to this question.

The Symbol 3, drawn for the usability testing, was chosen by more users than other alternatives. By comparison, it can be said that the other symbols are less evocative. The supermarket trolley, for instance, is likely to remind users of a supermarket rather than a local food shop, with the 'Food Store' label. The font size of the 'Food Store' label is also smaller than others. Likewise, the abstract green house in Symbol 1 might need further interpretation by the users. The outcomes showed that an associative and pictorial symbol as in Symbol 3 easily assembles the intended meaning/message and user interpretation. This example's legible 'Food' label also supports the intended message.

7.2.2 Which local food shop is the closest to Barbara and Tom's house?

The question in the spatial information group asked the participants to interpret the distance when line and area symbols were being used. The visualisation workshop generated four outcomes for this question, but only two were transferred to the usability testing. The example in Figure 6.6 in Chapter 6, which uses numbers to show distance, was excluded because the numbering may refer to different hierarchical meanings rather than distance/proximity.

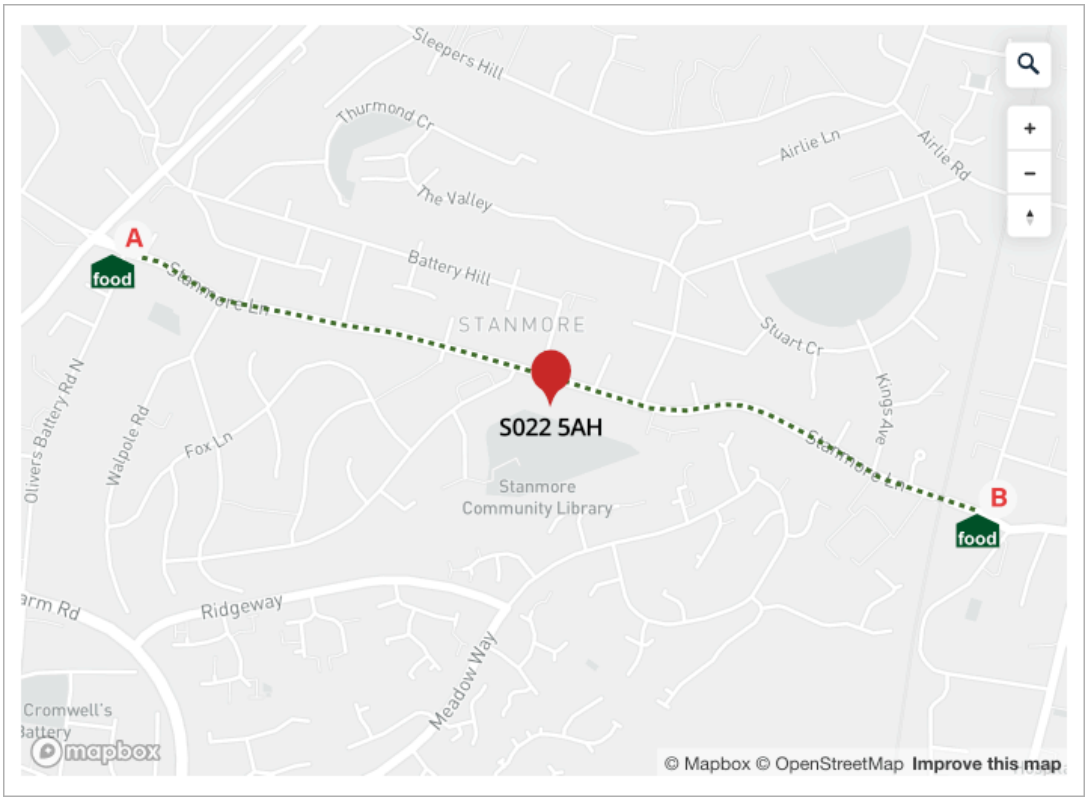


Figure 7.3 Map showing the control version, where the symbols in A and B are placed on opposite sides of Barbara and Tom's house on the base map and located at a spatially equal distance on both sides.

The second example in Figure 6.7 offers a point symbol arbitrarily located on the map interface and not directly related to distance/proximity, so was also excluded. The other outcomes derived from the workshop were directly transferred to the usability testing (see Figs 6.4 and 6.5 in Chapter 6).

Figure 6.4 in Chapter 6 was presented in three versions in the usability testing to clarify whether users can correctly interpret the distance with the size variable. In the question, the participants were expected to choose "equal distance" for the control version (see Fig. 7.3 above). However, the participants were not supposed to choose "equal distance" for version 1 and version 2 below if the size variable could create an ordinal difference in the interpretation.

The control version above shows the same line symbol without any difference in size variable for the same distances on opposite sides from the start point (see Fig. 7.3). The other two versions below combine the line symbol with a thicker and thinner size

variable and ask users to reinterpret the distance (Figs 7.4 and 7.5 below). Although the line shows the same distance in these versions, it is explored how the size variable affects the decision when interpreting the distance to local food shops on each side by changing the position of the thicker and thinner lines. All users saw the control version, and then the participants saw only one of the first and second versions.

In the control version above, the local food shop Symbol 2 (Fig. 7.2 in Section 7.2.1) is used to display Shop A and Shop B (Fig. 7.3 above). The symbols for A and B are placed on opposite sides of Barbara and Tom's house on the base map and located at a spatially equal distance from Barbara and Tom's house. The control version explored whether the same symbol (line) and variable (size) on both sides deliver an accurate interpretation to understand the distance.

In versions 1 and 2 below, the location of the symbols A and B on the map remained the same (Figs 7.4 and 7.5 below). In the first version below, the distance to A and B from Barbara and Tom's house is still equal, while the line going to shop A was drawn thicker than the line going to shop B (Fig. 7.4 below).

In the second version, the line going to Shop B is drawn thicker than the line going to Shop A, without any other change (Fig. 7.5 below). These two versions test the size variable at two points separately, going right and left, to see whether the size variable creates confusion when interpreting the distance. The expectation is that the participants are less likely to interpret the distance as equal if the size variable works well in versions 1 and version 2.

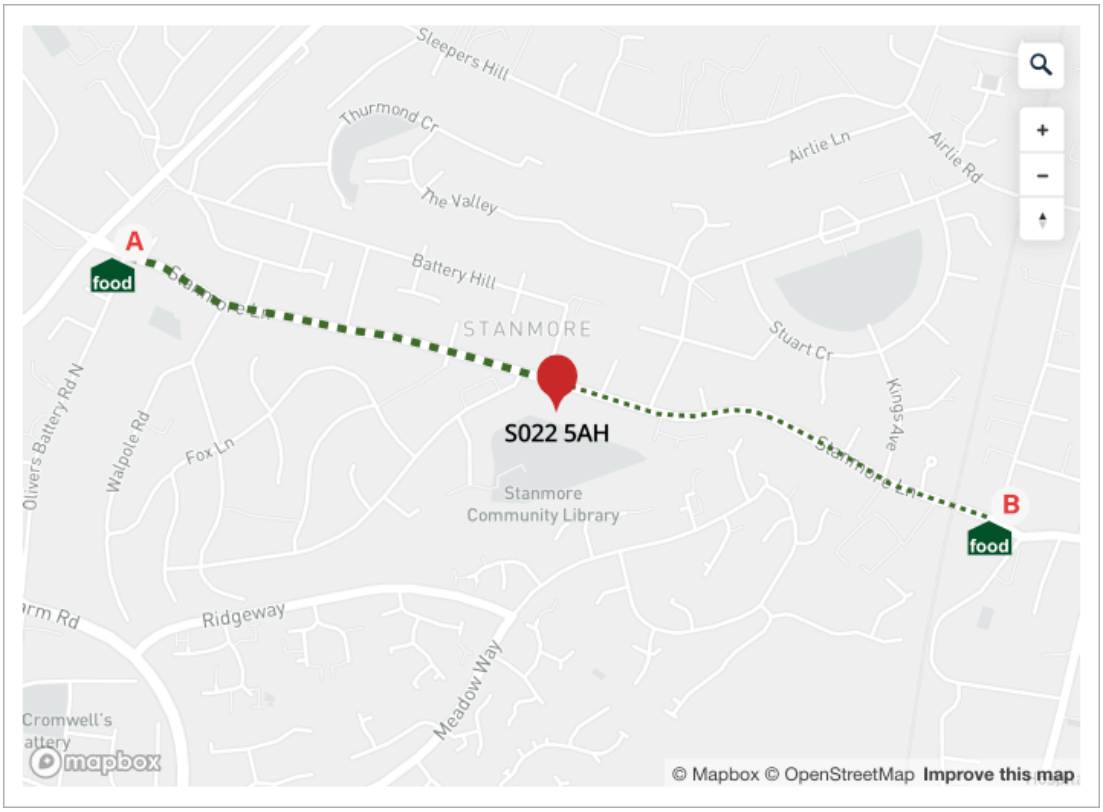


Figure 7.4 Map showing version 1 using a thicker line symbol on the left side.

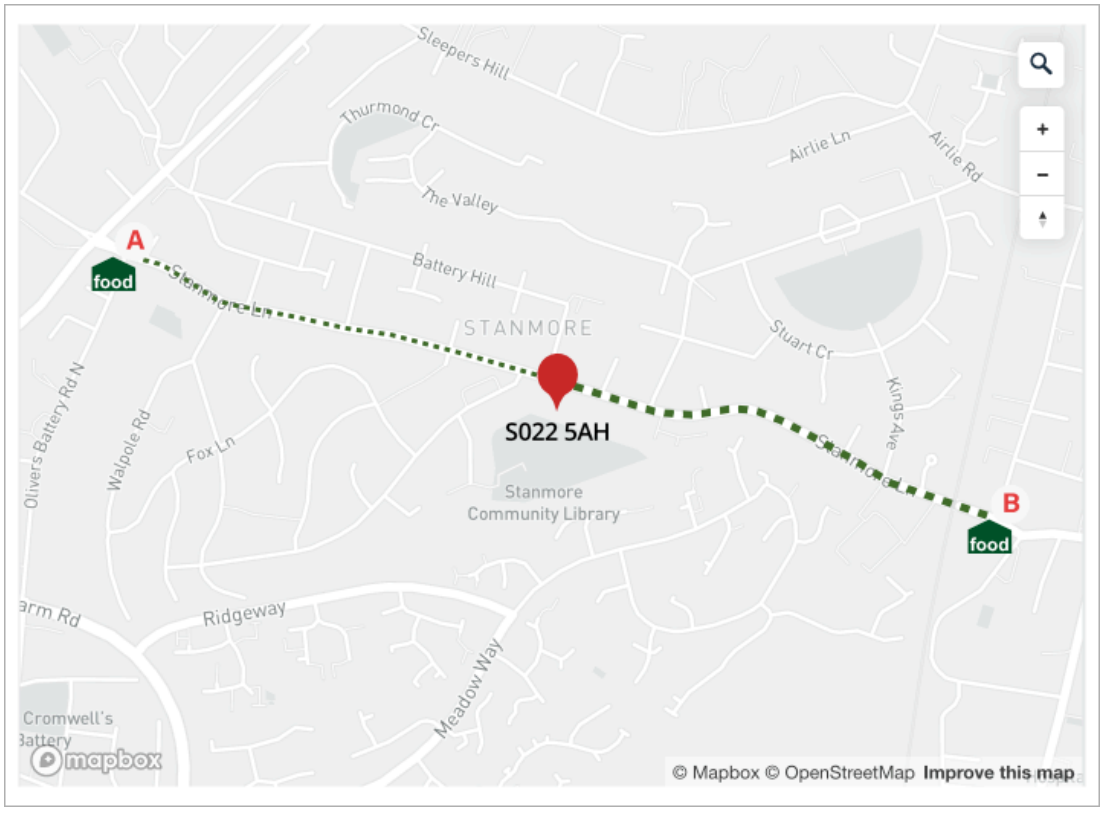


Figure 7.5 Map showing version 2 using a thicker line symbol on the right side.

The outcomes showed that fifty participants out of sixty-five who answered this question for the *control version* indicated that Shop A and Shop B were an equal distance to Barbara and Tom's house (Table 7.2 below). *It seems that most participants could decide the distance correctly without a measuring tool in all age groups in the control version.*

Only twenty-nine participants saw *version 1* in all age groups in total. Of these, six participants chose that Shop A is closer than Shop B, when the size variable going to Shop A is thicker. Twenty-one out of twenty-nine participants chose that Shop A and Shop B were still an equal distance from Barbara and Tom's house (Table 7.2 below). Fourteen out of nineteen users aged 26–44 thought the distance was still equal, but those aged 65–84 did not agree with other participants (Table 7.2 below).

In *version 2*, seven out of a total of thirty-four participants chose that Shop B is closer than Shop A, when the size variable going to Shop B is thicker. Nineteen out of a total of thirty-four participants thought that Shop A and B were equidistant from Barbara and Tom's house (Table 7.2 below). Four participants out of seven aged 18–25 thought that the two distances were still equal, while three of them thought that shop A was closer than Shop B (Table 7.2). Eighteen participants aged 26–44 who answered this question were split between three options (Table 7.2 below). Three participants, all aged 65–84, believed that the distance was still equal in version 2 (Table 7.2 below).

The outcomes of the control version showed that an accurate perception of two equidistances could be interpreted by combining the same line symbol and the same size variable (Table 7.2). However, the outcomes for the other versions illustrated that the participants might be puzzled by the changes in version 1 and version 2 (Table 7.2). Thus, it is possible to think that the size variable affects the interpretation of the hierarchy at different distances.

Table 7.2 Assessment of distance in selected version by number of participants and age group

	18-25 years old			26-44 years old			45-64 years old			65-84 years old		
	Control version	Version 1	Version 2	Control version	Version 1	Version 2	Control version	Version 1	Version 2	Control version	Version 1	Version 2
Shop A is closer to Barbara and Tom's house than shop B	2	1	3	6	4	5				1	1	
Shop B is closer to Barbara and Tom's house than shop A				3	1	6			1		1	
Shop A and B are equal distance to Barbara and Tom's house	10	4	4	27	14	7	9	3	5	4		3

The second investigation, regarding spatial information derived from the workshop, concerns the combination of the area symbol with the colour value variable to display the hierarchy between the distance of the three local food shops (Fig. 7.6 below). According to the spatial arrangement of the three symbols, A, B, and C display the hierarchy from the farthest local food shop to the closest one. Sixty-three participants out of sixty-five chose the 'C' as the closest local food shop to Barbara and Tom's house. Two participants did not answer this question. This outcome illustrated that *almost all participants in each group could visually compare the proximities accurately when the area symbol is used with the colour value variable.*

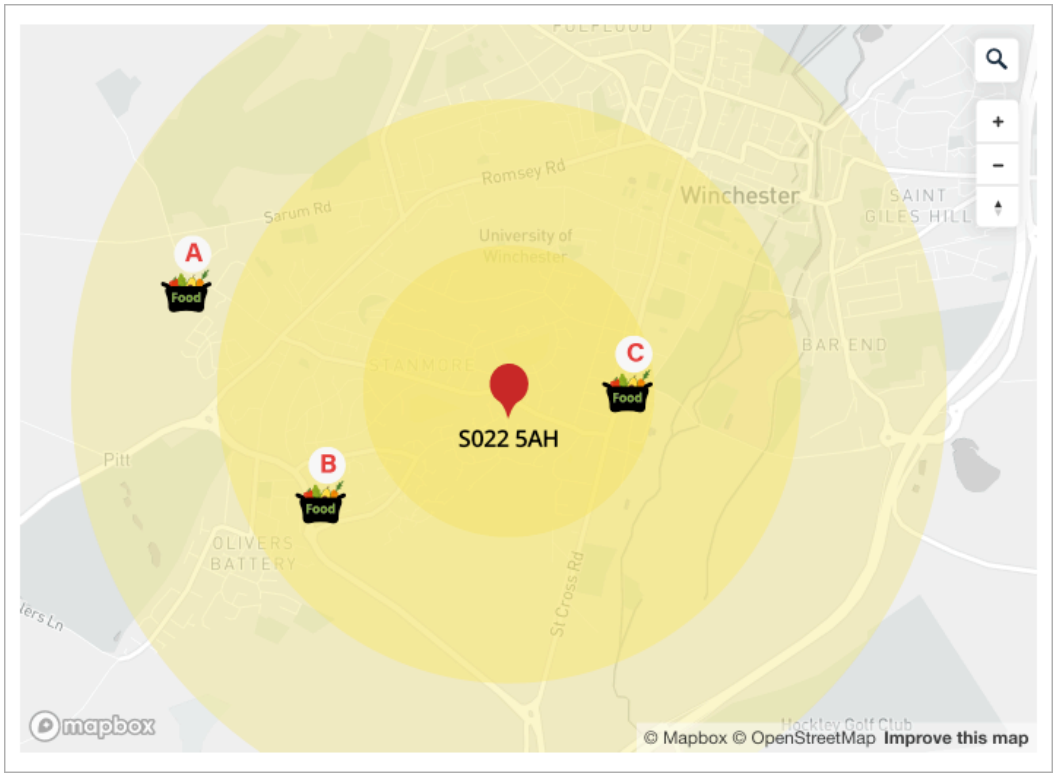


Figure 7.6 The second outcome derived from the workshop, asking about the hierarchy between the distance of three local food shops.

To summarise, the outcomes of this question showed that participants could interpret the distance accurately when using the line symbol without any variables. Further, in versions 1 and 2, which used the size variable with the line symbol, it was found that the size variable created more confusion in interpreting the same distances. Thus, it is likely that further studies examining the line symbol with the size variable could make the symbol ordered or quantitative and help users determine proximity. Further, when the same question was asked using the combination of the area symbol and the colour value variable, almost all participants could visually interpret the hierarchy between the distances. Thus, the usability testing outcomes in this thesis showed that a colour value with an area symbol instead of a size variable with a line symbol could be more helpful in comparing distances without giving numerical information.

7.2.3 Which food seller do you think is more likely to sell cherry tomatoes?

This question asked the participants to choose one of three local food symbols that they think are more likely to sell cherry tomatoes (Fig. 7.7 below). (See **Appendix 4** for the usability test screenshots.) Symbol 1 in Figure 7.7 among the options was derived from the visualisation workshop and directly transferred to the usability test. It can be classified as a geometric/abstract symbol as it displays the tomatoes with red dots. The disadvantage of using geometric/abstract symbols is that participants must find a link between signifier and signified thing. This symbol is used for usability testing to determine whether users can interpret this abstract representation correctly. Symbol 5 in Figure 7.7 was designed from scratch for the usability test by the author to test a more associative symbol. These two symbols provided one pictorial/mimetic and one geometric/abstract symbol, and it was desired to test which of two different representations the users chose. Symbol 4, derived from the workshop, was reformed before transferring to the test by adding a background to avoid clutter on the map interface, considering the figure–ground and contrast relations. Two symbols designed by the designers were not used in the usability testing because one was not a vector (Symbol 2, Fig. 7.7 below) and Symbol 3, because it was designed as an information box containing all relevant information. This later example is suitable for working with layers in a GIS-based mapping system rather than maps without layers and is, therefore, not included as usability testing was carried out with a one-layer map interface.

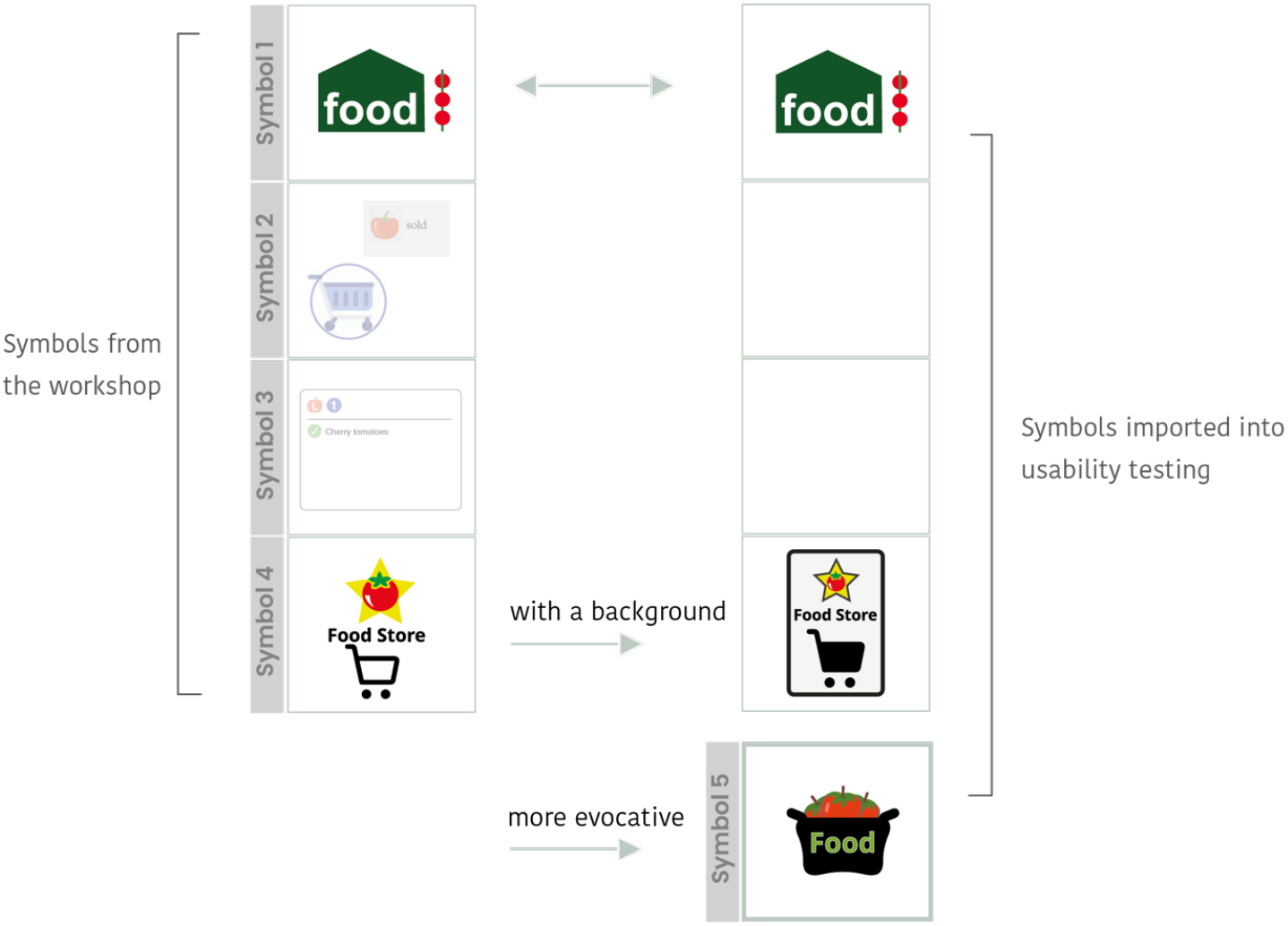


Figure 7.7 Local food shop symbols selling cherry tomatoes designed in the visualisation workshop, and those included and rearranged in the usability testing.

Sixty-one participants responded to this question by choosing one of the three symbols on the base map, and four skipped it. The outcomes show that the most frequent response is Symbol 2 in Table 7.3 below for all age groups. Forty-three participants out of sixty-one chose newly designed Symbol 2 (Table 7.3 below). Further, the total number of participants choosing Symbol 1 and Symbol 3 is equal (Table 7.3 below). Thus, the participants chose one of the pictorial symbols (Symbol 2) to represent the cherry tomatoes instead of a more abstract one (Symbol 1).

Table 7.3 Choice of symbol for food shop selling cherry tomatoes, by number of respondents and age group.

		18-25 years old	26-44 years old	45-64 years old	65-84 years old	Total number of respondents
Symbol 1		1	7	1		9
Symbol 2		11	22	6	4	43
Symbol 3			6	2	1	9

The outcomes show that a legible pictorial symbol can make the meaning evocatively strong, simple and straightforward. It is clear that the pot of tomatoes (Symbol 2) has more connotations for users than Symbol 3, where the 'supermarket' symbol is more dominant than the tomato. Type and colour use in Symbol 2 also increase the legibility.

7.2.4 How would you describe the distance between Eastleigh and Winchester?

Based on Barbara and Tom's scenario, cherry tomatoes come from Fareham to Winchester by stopping at Eastleigh on the map shown (see Table 6.1 in Chapter 6 for more details on the short versions of the user scenarios). The distance from Fareham to Eastleigh is greater than from Eastleigh to Winchester. In this question, the participants are expected to visually interpret the hierarchy between the distances correctly, represented in three different versions, without being given any information about the distances. In total, *sixty participants out of sixty-five* answered this question, and each respondent saw only one version.

While preparing the three alternatives for this question, the answers to the two questions obtained from the workshop were rearranged. The solutions provided to two questions in the workshop (see 6.3.2 and 6.3.3 in Chapter 6) required testing of more than one variable, one by one. So, the question about CO_2 was not migrated to user testing per se, but the suggested answers to this question were rearranged to ask about the distance between Eastleigh and Fareham. Further, Symbolisation 1 in Figure 6.8, which follows the base map roads, was not transferred to the usability testing as it is far more evident than other outcomes.

The first version of this question used a red curved line symbol derived from the workshop (Fig. 6.10, Symbolisation 3). The original outcome derived from the workshop included an area symbol and labels. Labels were not used in the usability testing as they made the answer too obvious. The green area symbol in this question was also eliminated as the combination of line and area symbols is used in other versions.

Figure 7.8 Map showing that the distance from Fareham to Eastleigh is greater than from Eastleigh to Winchester, using curved lines in different sizes.

Therefore, in the first version, a thick curved line symbol between Fareham and Eastleigh and a thin curved line between Eastleigh and Winchester were drawn to represent the differences between the distances (Fig. 7.8 above).

It was tested whether the participants could reach the correct conclusion about the distance when a size variable was used. Twenty-two participants tested this version, and only two of the seven participants aged 18–25 who saw this version interpreted the distance correctly. Of these seven, four participants marked equal distances between Fareham and Eastleigh and between Eastleigh and Winchester. Five of the ten participants aged 26–44 interpreted the distance correctly. However, the other five participants did not agree. Two of the three participants aged 45–64 chose the correct answer, and the other one marked the equal distance option. One participant between the ages of 65 and 84 chose the correct answer, but one chose equal distances between Fareham and Eastleigh and Eastleigh and Winchester. *The outcomes of this question showed that eleven participants chose the two distances to be equal, and ten participants chose the distance between Fareham and Eastleigh to be longer than the distance between Eastleigh and Winchester*. Thus, it can be said that a curved line that does not follow paths on the base map with the size variable is not useful for interpretation of distance.

The second version consists of an area and a line symbol derived from the workshop, shown in Figure 7.9 below. Seventeen participants tested this version. One of the two participants aged 18–25 who saw this version interpreted the distance correctly. All the participants between the ages of 45–64 and 65–84 chose the correct answer (4 participants). Ten participants out of eleven between the ages of 26-44 also marked the correct option. *Thus, fifteen out of seventeen participants across all age groups interpreted the distance correctly*. This outcome showed that an area symbol and line symbol combination could work well to interpret distance.

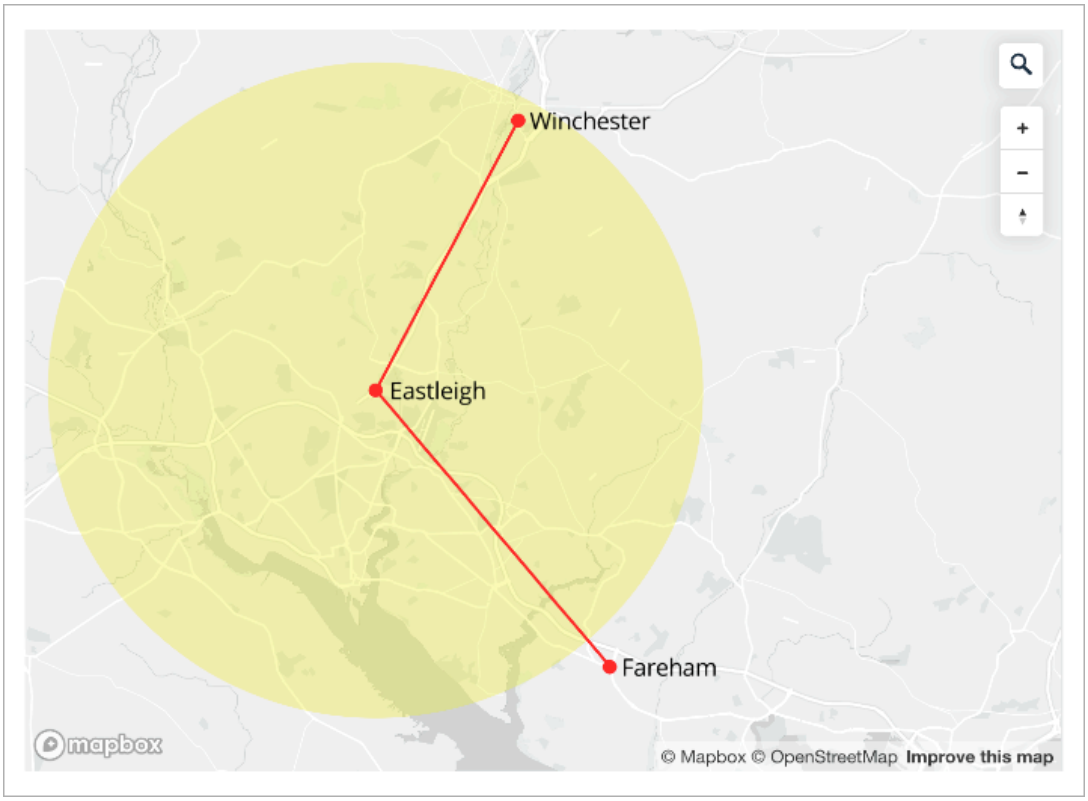


Figure 7.9 Map showing that the distance from Fareham to Eastleigh is greater than from Eastleigh to Winchester, using an area symbol and line symbols.

The third version shows three area symbols in semi-transparent pink located on Fareham, Winchester and Eastleigh (Fig. 7.10 below). This representation uses Symbolisation 2 in Figure 6.10, Chapter 6, but removes irrelevant graphics, such as the lorry. Then, the line symbols/arrows drawn between the three locations in different sizes and lengths imply the difference in distance. Twenty-one participants saw the third version. One participant aged 18–25 who saw this version interpreted the distance correctly. Fourteen out of the fifteen participants aged 26–44 interpreted the distance correctly. However, the other participant marked the equal distance option. All the participants between the ages of 45–64 (4 participants) and 65-84 (1 participant) also chose the correct answer. *In this version, twenty out of twenty-one participants in all age groups interpreted the distance correctly* (Fig. 7.10 below). As in the second version, using the area and line symbol together allowed the users to interpret the total distance correctly.

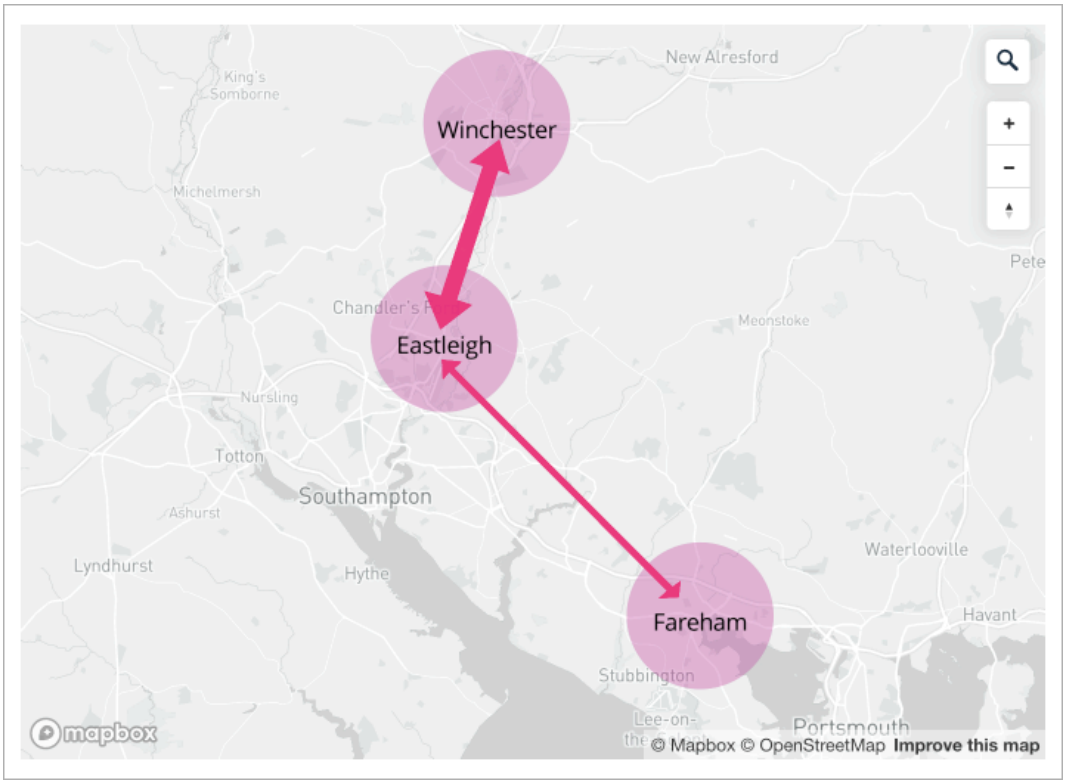


Figure 7.10 Map showing that the distance from Fareham to Eastleigh is greater than from Eastleigh to Winchester, using an area symbol and line symbols with arrows.

To summarise, in the first version, where a line symbol was used with a size variable, the users did not interpret this combination correctly, although size variation is quantitative in perceptual formation (see Fig. 7.11 below). A possible explanation may be that a slight difference in the curve length made it difficult to interpret the distance correctly. Further, most users accurately interpreted versions 2 and 3 in the same question (Fig. 7.11 below). Version 2, which included an area and line symbol, was interpreted as accurate in displaying that the straight-line length between Eastleigh and Fareham is longer than that between Eastleigh and Winchester. In support of line symbol use, the yellow area symbol also reinforced the accurate information about the distance by putting Fareham out of the yellow area in this representation. In the third version, three locations were positioned with the area symbols on the base map. The distances between the three

	The distance from Fareham to Eastleigh and Eastleigh to Winchester are equal	The distance from Fareham to Eastleigh is greater than Eastleigh to Winchester	The distance from Fareham to Eastleigh is less than Eastleigh to Winchester
Version 1	11	10	1
Version 2	1	15	1
Version 3	4	20	1

Figure 7.11 How many times each version was selected in total.

locations were visualised with the line/arrow symbol and the size variable. A shorter length, shown as between Winchester and Eastleigh, was drawn with a thicker and shorter line to make the proximity perceptible. Even though the line symbols do not follow the base-map routes in this example, the area symbols would approximately depict the distance between three locations, and the three area symbols' proximity may likely be interpreted accurately because of their position.

Therefore, the participants' responses indicate that version 2 and version 3 might be more understandable than version 1. This result demonstrates that using only one symbol (line) did not make the interpretation clear for users, but combining two symbols (line and area symbols) makes the intended message simple and clear.

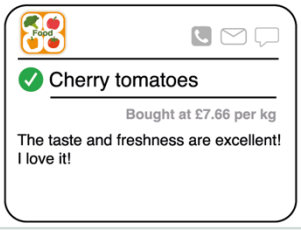
7.2.5 Which sellers' way of displaying information would be suitable for you?

Based on the consumer-based user scenario, Barbara and Tom want detailed information about cherry tomatoes (see Table 6.1 in Chapter 6 for the consumer scenarios investigated in the visualisation workshop). This question asked the participants to choose one of the representation styles showing another customer's comment, product price and contact options with the

seller. These points emphasise the consumers' concerns regarding food quality (see Chapter 5 for the survey outcomes). These questions were investigated with different tasks in the visualisation workshop but combined into one question in the usability tasks. Not all of the solutions were transferred to the usability testing because the responses in the visualisation workshop were aggregated into two representation solutions: speech bubbles or information boxes. In this context, this question aims to test whether users find information placed directly in the map interface or in an information box more useful.

In the first representation, the detailed information about the product takes place over the map using a speech bubble, email icon and price attachment (Table 7.4). All the information is given in the white box in the second representation. The outcomes showed that forty-three participants out of sixty-two in all age groups chose the second option, the white box (Table 7.4). In this representation, the information is well-organised in the white information box, even though the text size makes it difficult to read. This result shows that users want to see related information on a map in a well-organised separate area/layer.

Table 7.4 Number of respondents selecting each option, by age group and overall.

	18-25 years old	26-44 years old	45-64 years old	65-84 years old	Total number of respondents
	1	6	4	1	9
	10	29	9	2	43

7.3 Analysis of vendor-based usability testing outcomes

The following part of the usability test moves on to the vendor-based tasks, which followed Rob's scenario (see Table 6.2 in Chapter 6 for the vendor scenarios investigated in the visualisation workshop). It focuses on graphic variable shapes called landmarks on maps, and this focus continues with users' symbol choices on a prospective local food map.

7.3.1 What symbol would you choose to show Rob's farm on the map?

The first question asked participants to choose the most appropriate symbol showing Rob's farm on the map. Four symbols shown in Table 7.5 were obtained from the visualisation workshop. The third and fourth symbols were originally created as one symbol in the workshop, but they are separated into two symbols for the usability test (see Fig. 6.16 in Section 6.5 for the original version of the symbol designed in the visualisation

Table 7.5 Number of respondents selecting each farm symbol, by age group and overall.

		18-25 years old	26-44 years old	45-64 years old	65-84 years old	Total number of respondents
Symbol 1		1	7	3	1	12
Symbol 2		6	12	2		20
Symbol 3		1	2			3
Symbol 4		3	15	4	3	25

workshop). The reason is to reveal the users' choice of pictorial/abstract symbols or labels.

Sixty participants answered this question. The most chosen symbols are Symbol 4 and Symbol 2 (Table 7.5 above). Symbols 4 and 2 were selected by fifteen and twelve participants aged 26–44, respectively. Symbols 4 and 2 are the most chosen symbol by the participants aged 26-44, and three participants out of four chose Symbol 4 in the 65–84 age group. In total, twenty-five out of sixty participants chose Symbol 4, while twenty chose Symbol 2 (Table 7.5 above).

The results of this question point out that a legible label (symbol) like Symbol 4 in Table 7.5 could successfully be used as a landmark on maps rather than a pictorial/abstract symbol. Symbols have a specific typographic quality because they can be presented independently or in conjunction with verbal language, and each situation has unique requirements for how they are designed, and their legibility and understandability (Luna, 2018: 80). In this example, the font style is Helvetica; the font style and size facilitate legibility. Further, in the second most preferred symbol, the farm was depicted with a symbol evoking a barn with a leaf graphic (Symbol 2 in Table 7.5 above). The leaf graphic and green colour may have made it easier for users to connect with a farm with this example. An abstract farmhouse in green colour rather than a pictorial shopping basket may more directly evoke a farm shop for users.

7.3.2 What do you expect to see in the A and B locations shown on the map?

This question has three versions consisting of different representation styles. Three versions derived from the workshop were directly moved to usability testing. However, the fourth version was not included in the usability testing, as it was not a vector (see Fig. 6.16 in Section 6.5 for the fourth participant's response). This question displays one of Rob's farm's symbols and a second symbol, which conveys some identical features to Rob's farm's symbol in each version (Figs 7.12, 7.14 and 7.16 below). The designers at the visualisation workshop drew the second set of

symbols with Rob's farm corporate identity in mind to showcase other stores selling Rob's products (see Fig. 6.16 in Section 6.5). The participants in the usability test were tested whether they could interpret this relationship with the given symbols. The expected interpretation was 'Other shops that sell Rob's products.

Each version presents one correct answer that is expected to be chosen and three irrelevant/confusing answer options that may evoke different meanings about Rob's farm symbol. The reason for changing the answer options in each question is that the expected answer can be obtained easily, as the users see this question by following the other questions in the test. For example, in Figure 7.14 below the only difference between the first symbol and the second is that the background colour turns green. In this example, it is thought that users can more easily interpret the relationship of the second symbol group with the first. In addition, the corporate identity carrier used in the first example in Figure 7.12 below is the letter 'R'. The abstract symbolisation in this example may make different calls to users. The question of whether the 'R' label in an abstract symbol can enable users to reach the expected answer was tested through multiple options. The third example tests whether a second abstract symbol, which is formed with corporate identity carriers without using labels, still would provide the expected relationship when there are other answer options (Fig. 7.16 below). Thus, three versions of this question investigate whether the relationship between them would be interpreted correctly, especially when carrying corporate identity elements to different symbols. In the usability testing, the three versions were shown to all participants.

In the first version, the second symbol conveys the 'R' letter to keep the identity of Rob's farm (Fig. 7.12 below). The participants were given four answer options (Fig. 7.12). Fifty-seven participants out of sixty-five answered this question. *Even though the second symbol design does not directly relate to Rob's farm, in total, thirty-seven participants chose that the second symbol shows the 'other shops that sell Rob's products'* (Fig. 7.13 below).

Figure 7.12 Test screenshot showing the first version, asking about the relationship between the main and secondary symbols.

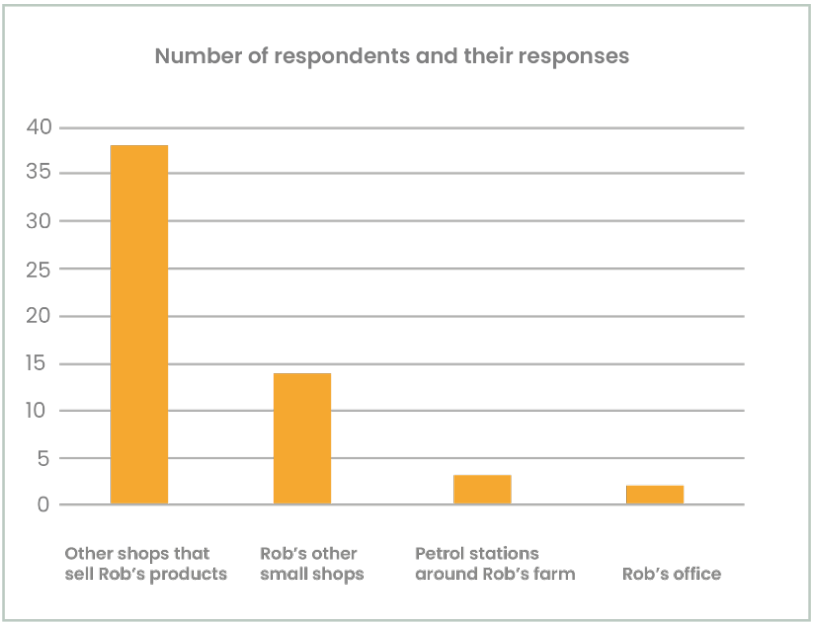


Figure 7.13 The number of times each option was chosen by the respondents.

Further, twenty-three participants out of thirty-five aged 26–44 and at least half of the participants in each age group who answered this question chose the option that the second symbol is *'other shops that sell Rob's products'*. This outcome shows that the choice of the 26–44 age group participants, which represents the majority of the participants, is dominant in the test result. The second most frequently chosen option was '*Rob's other small shops'*, with fourteen participants (Fig. 7.13 above). Of these, eight participants are aged 26–44.

The second version shows the pictorial box of vegetables to indicate Rob's farm on the map. The second symbol group in this example carries the identity of Rob's farm, changing the background to green (Fig. 7.14).

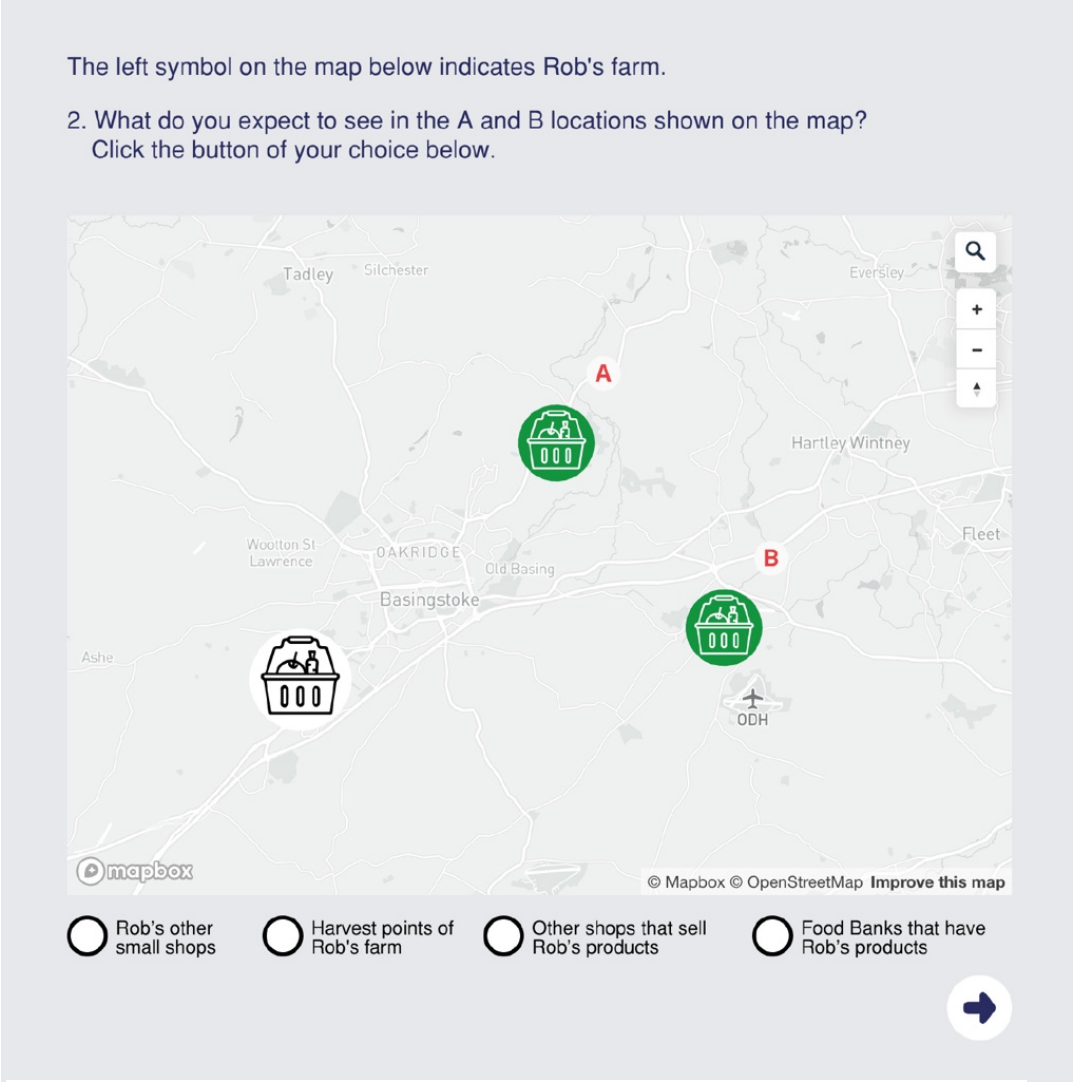


Figure 7.14 Test screenshot showing the second version, asking about the relationship between the main and secondary symbols

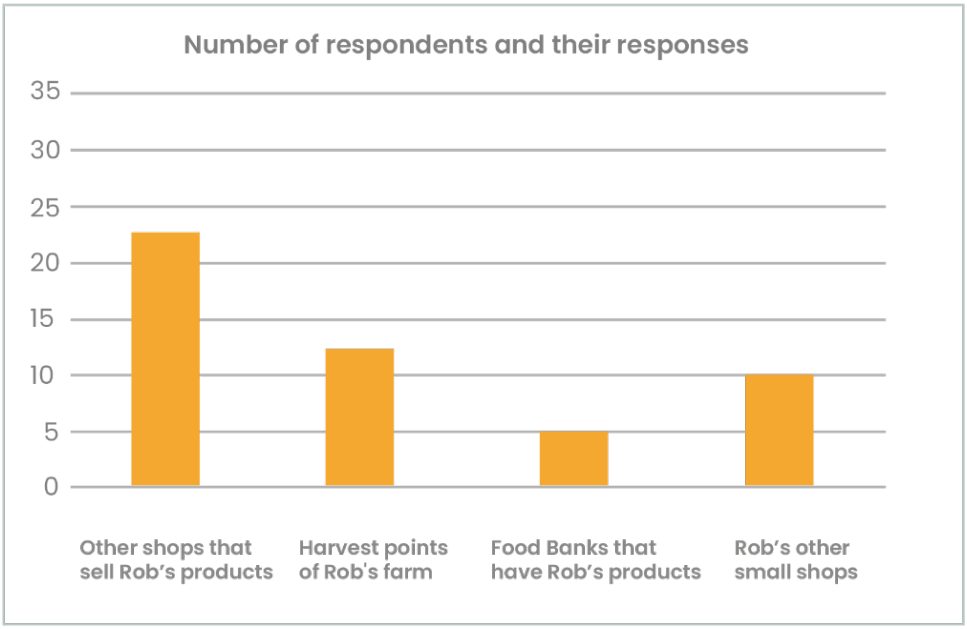


Figure 7.15 The number of times each answer was chosen by the respondents.

The outcomes illustrated that twenty-three participants out of fifty marked 'other shops that sell Rob's products' for the second symbol (Fig. 7.15). However, the remaining participants chose two other options: 'Rob's other small shop' (ten participants) and the 'Harvest point of Rob's farm' (twelve participants) (Fig. 7.15).

The outcomes showed that the participants in all age groups were more confused about the four options in this question. Fourteen participants out of twenty-nine in the 26–44 age group chose the 'other shop selling Rob's products' option. In contrast, the other twelve participants chose the 'harvest point' and ten chose 'Rob's other small shop' options. Likewise, while three participants in the 18–24 age group chose 'other shop selling Rob's products', four chose the 'food bank' option, and three marked the 'harvest point' options. *When the total number of participants is considered, it can be seen that almost half of the participants (23 out of 50) gave the expected answer but the distribution of age groups was divided among all the options.*

In the third version, in total, the most chosen option was 'Harvest points of Rob's farm' by twenty participants (Figs 7.16 and 7.17 below). Sixteen of the thirty-four participants in the 26–44 age group chose 'Harvest points of Rob's farm', while the other eighteen were distributed among the other three options. The expected answer, 'Other shops that sell Rob's products', was

chosen by thirteen participants of all age groups (Fig. 7.17 below). Further, twelve participants marked 'Healthy-eating restaurants that buy from Rob's products', and seven chose 'Rob's other small shops' (Fig. 7.17 below). *The outcomes showed that participants were puzzled about the three options in this symbolisation.*

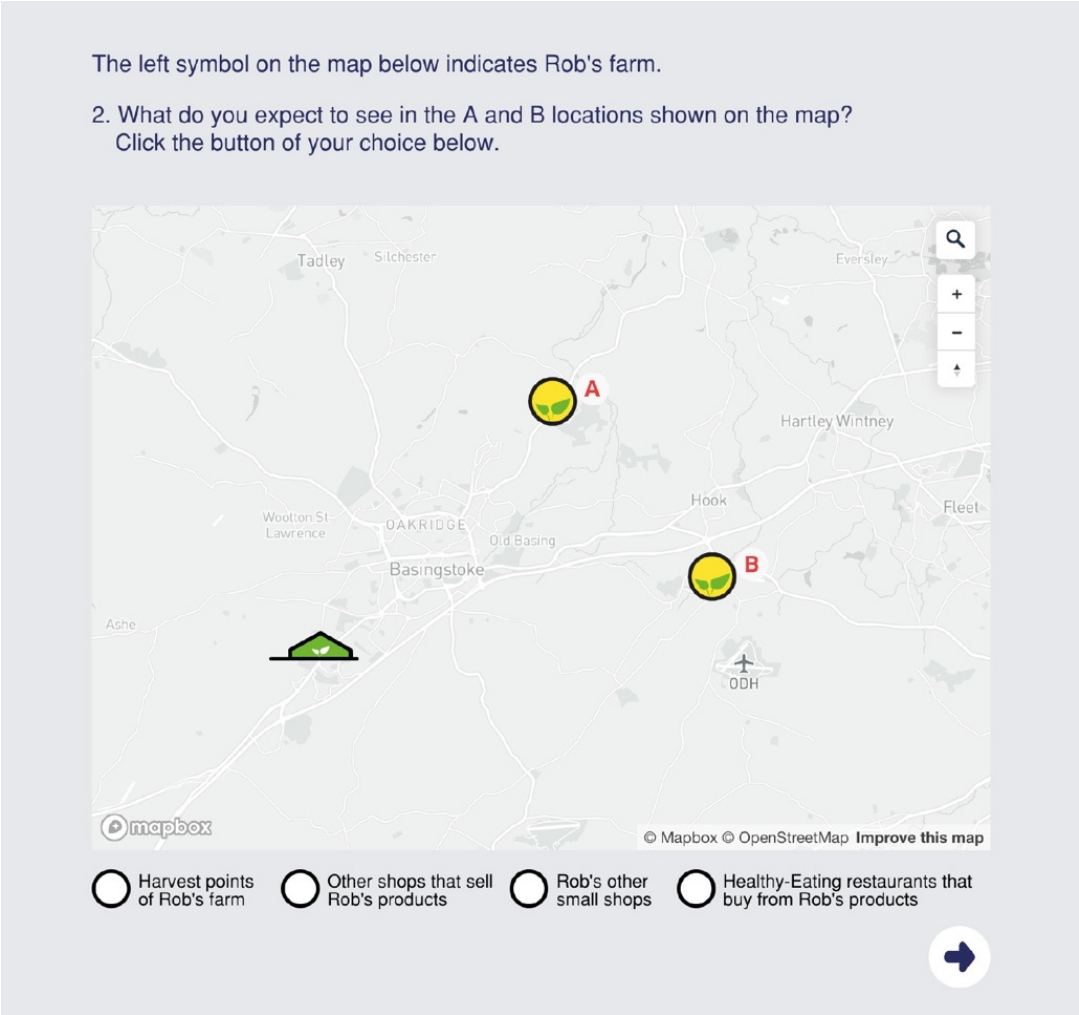


Figure 7.16 Test screenshot showing the third version, asking about the relationship between the main and secondary symbols.

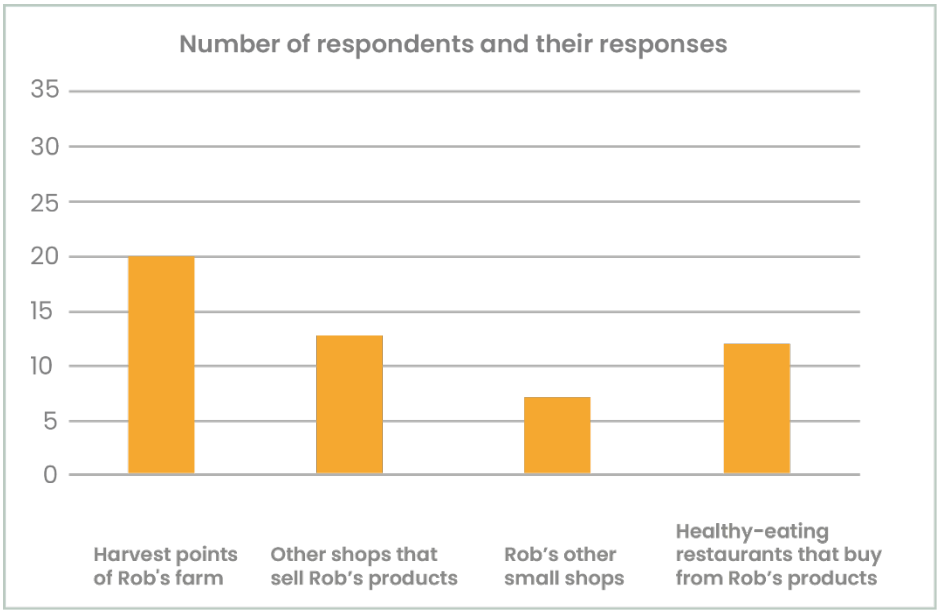


Figure 7.17 The number of times each option was chosen by the respondents.

As a result, it is seen that the responses were affected because the options in the questions changed. This is even though thirty-four people who established the expected relationship in the first version accounted for more than half of those who answered this question. It is notable that the 26–44 age group predominated in that group of thirty-four people. It can be considered that the 'R' letter and the same red colour carry Rob's farm identity effectively in the first version. Although the secondary symbols use the same graphic element as the primary symbol in versions 2 and 3, the expected relationship does not seem as dominant as in the first version. However, in the second and third versions, the age distribution of participants who can establish the right relationship seems more homogeneous. *These results do not confirm that users are influenced by pictorial or abstract representations when associating two symbols. However, it might indicate that a label that is a carrier of identity might be a helpful graphical element in associating two symbols.*

7.3.3 Which seller has both home delivery and click-and-collect options?

In the final question following the vendor-based scenarios, the participants were asked to choose the symbols showing both

home delivery and click-and-collect options (Fig. 7.18). 'Both' and 'none' were added to the answer options for cases where both or none of the symbols shown met the expected meaning (Fig. 7.18).

In this last graphic variable shape task, forty-three participants out of sixty-four thought that Symbol B involved both the home delivery and click-and-collect options (Fig. 7.18). Pictorial lorry and shopping basket symbols might be the main reason for choosing this answer. Another likely explanation is that these symbols are conventional, and the participants are familiar with them. Only five chose Symbol A (Fig. 7.18). Symbol A does not evoke the click-and-collect option with a luggage

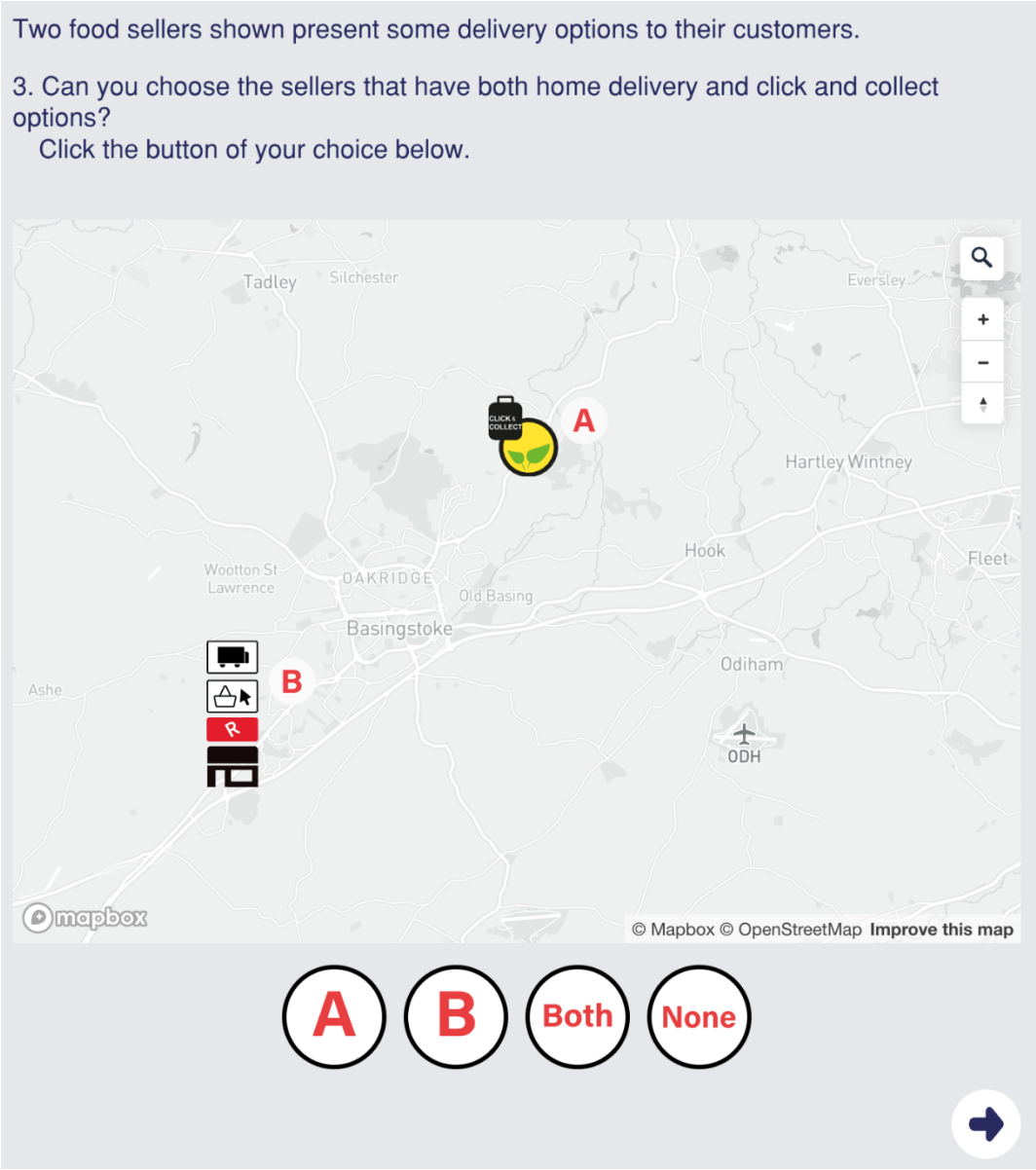


Figure 7.18 Test screenshot showing delivery symbols with four options.

-type bag, because the luggage bag breaks the semantic relationship, and the font size makes readability difficult. Six participants thought none had home delivery and click-and-collect alternatives. Of these, three participants were in the 45–64 age group.

7.4 Conclusion

The usability test provided an opportunity to involve potential users in the evaluation stage to determine the usability of the local food map interface elements in a user-oriented way. In particular, the usability test collected a number of insights gained from stakeholders to understand the functionality of the design elements – symbols, variables, and labels – of the local food map. The main finding from the usability testing was that symbols designed by information designers with design criteria in mind are likely to be more easily interpreted by local food map users. The most obvious finding to emerge from the graphical variable shape tasks are:

(1) Users can interpret the meanings of pictorial/mimetic symbols more easily than geometric/abstract symbols (see Table 7.1 for Symbol 3 and Table 7.3 for Symbol 2).

(2) Combining a pictorial symbol and a label can increase comprehensibility and clarity, and users may find what they are looking for much more easily (see Table 7.1 for Symbol 3 and Table 7.3 for Symbol 2).

(3) A label can act as a symbol in the map interface (see Table 7.5 for Symbol 4).

(4) A label can be more understandable than a pictorial or abstract symbol, like being chosen the label “Rob’s farm” instead of a pictorial symbol (see Table 7.5 for Symbol 4).

(5) Legibility in typefaces, symbols and labels affects users’

symbol choice and requires consideration in the maps' text and visual assessment (see Table 7.1 for Symbol 3 and Table 7.3 for Symbol 2).

(6) Legibility is positively affected by selecting standard typefaces to create a typographic layout in symbolisation. For instance, the labels on the chosen symbols, the local food shop selling cherry tomatoes and farm symbols, were written with Myriad Pro and Helvetica, type styles classified as sans serif type (see Tables 7.1 and 7.3).

(7) High contrast between the text and its background on a symbol improves legibility, like the black pot's green 'Food' label (see Table 7.1 for Symbol 3).

(8) High levels of abstraction negatively affect the comprehensibility of a symbol, making it difficult to interpret its meaning, as in signifying the cherry tomatoes using red dots (see Table 7.3 for Symbol 1).

(9) Considering the context in the design can affect the consistency of users' choices. For example, participants chose symbols that maintained the same design catalogue in sequential vendor-based tasks (see Table 7.5, and Fig. 7.12, Fig. 7.14, Fig. 7.16 and 7.18).

(10) Users chose conventional symbols that they are familiar with for delivery options, instead of the symbols designed from scratch (see Fig. 7.18 for the local food shop showing home delivery and click-and-collect options in Symbol B).

Regarding the question about the detailed product information, the white box was the most chosen response (see Table 7.4). In this example, seeing related information on a map within a defined area instead of directly seeing it on the base map allows users to access related information as a whole. In this regard, if the related/detailed information is well organised and is designed to consider the information's legibility and readability, working with

multiple layers on maps can be a solution to make the information applicable and accessible for users.

The spatial information tasks asked the participants to interpret the distance visually without providing them with numerical information. The literature on cartography shows that the perceptual and semiotic properties that come with variables could enhance the comprehensibility of information on maps, making communication effective between map makers and map users. Thus, the spatial information group tasks asked distance/proximity questions using the ordered and quantitative formation of the size variable and explored whether local food map users would visually interpret information such as proximity.

Overall, the outcomes of the spatial information task analysis show that:

(1) When *a line symbol is used with an area symbol*, they can work effectively without using variables to describe quantitative or ordered information such as distance/proximity (see Fig. 7.9). This method ensured the correct interpretation of the distance for the different age groups participating in the survey.

(2) Combining *a line symbol, an area symbol and a size variable* may help determine the approximate distance without giving numerical information (see Fig. 7.10). Participants in different age groups chose the correct answer to this question.

(3) *An area symbol with a colour value variation* can give approximate information about the distance (see Fig. 7.6). Sixty-three participants out of sixty-five who saw this example interpreted the distance correctly.

(4) A line symbol might likely work with a size variable to interpret the same distances (Fig. 7.3). However, the difference in the feature of the size variable created more confusion for the participants when interpreting the distance (Figs 7.4 and 7.5).

The following chapter concludes the thesis by summarising the main themes that emerged from the information design research approach to cartography for a prospective local food map, discussing the contributions of this thesis to the field of research, and proposing possible avenues for future study.

8 Concluding remarks

This thesis adopted an information design approach to making local food maps easy for people to use by considering their local food buying and selling practices in their everyday lives. In this vein, this thesis has provided insight into the design process for information designers and cartographers to combine the two disciplines to create effective digital maps, specifically a prospective local food map. User research and multiple user-centred methods were applied to cartography to develop an information design approach. The key findings of this thesis are summarised in this concluding chapter. The final sections also discuss the contributions to the existing literature and suggest possibilities for future research.

8.1 Applying multidisciplinary user research methods to the literature on cartography

The research approach in this thesis was valuable since it embraced multiple methods that propose transferable insights into cartography. Findings from the user research stages were synthesised using various techniques to design the local food map interface elements graphically. The framework below contributes to the existing literature on the map-making process and aids information designers and cartographers in enhancing their understanding of user-oriented map-design processes:

(1) Using a variety of methods and techniques to synthesise user needs within a multidisciplinary domain;

(2) Carrying out an observation stage and a survey to determine the user's needs and propose transferable insights;

(3) Developing personas and user scenarios to transfer the target user group's needs to a digital map environment;

(4) Organisation of a visualisation workshop combining the design principles and conventions of two disciplines to

produce generalisable insights into map design at the design practice stage; creating interface elements of the local food map—symbols, variables, and labels—that would promote the usability of digital maps;

(5) Conducting a usability test with users to develop a picture of design effectiveness and usability.

Point 1 draws attention to making the information applicable to users of digital maps. This research focused on a specific use case: a prospective local food map. *In this vein, it outlined an operational framework that can be adapted to future digital map studies to reflect user needs.* Multiple methods (examining government documents, applying the visual communication and visual thinking model, carrying out an informal observation stage and a survey, developing personas and user scenarios, organising a visualisation workshop, and conducting a usability test) were employed in this study to ensure the outcomes are usable and compatible with digital map research and practices.

Points 2–3 relate to the methods driven by user research. What emerges from the literature investigated is that the digital world today calls for maps to be designed to meet users' daily needs. Users are the most crucial data source for identifying design needs (Frascara, 2015). For this reason, the observation stage in this thesis extended the literature review on local food and allowed the preparation of a well-designed user questionnaire to frame the local food map users' needs. In order to transfer the needs of people who buy and sell local food to the map environment, these needs were clarified and fixed through persona and user scenarios, and the tasks to be investigated in design practice (the visualisation workshop) were identified. *Therefore, other multidisciplinary studies in map design can benefit from the comprehensive user research undertaken in this thesis.*

The user research methods used in this thesis provide insight into future studies on defining the problem, seeking answers to the defined problem by including users in research, and measuring usability. First, the findings from examining government documents regarding rural–urban areas in the UK showed that no specific age group is clustered mainly in rural areas and that

interest in local food is unlikely to be affected by economic factors (see Chapter 4 for the research area and choropleth map studies). As a result of these findings, it was decided to study a broader geographic area with a wider range of rural districts (Berkshire, Hampshire, and Oxfordshire), thus providing a better understanding of local food map users and their relationship with local food.

Second, the most prominent finding from the observation stage across the research area—Berkshire, Hampshire, and Oxfordshire—was that FMs for consumers mean access to local food (see Section 5.1 for the observational assessment of FMs). The observations showed that consumers' demand for high-quality food might be the primary driver to visit FMs. It has been observed that shopping at FMs strengthens community involvement, apart from its relation to accessing local food. The findings from the observation stage also indicated that small talk between consumers and vendors is an essential part of shopping at FMs. Through small talk, consumers reduce anxiety about food quality, and the sense of belonging to the same community is strengthened for both groups.

Third, the observation findings support the relevance of the survey. The survey of consumers and vendors at FMs undertaken for this research first provided insights into the meaning of local food (see Section 5.2.3 for the discussion of the survey outcomes). Locals put forward some specific points while defining food as local, such as food quality, support for local businesses, knowing more about what they eat, and purchasing local food. The survey findings also showed that consumers and vendors who buy and sell local food are also interested in remaining local. Staying in the same community and contributing to the sustainability of local businesses were essential parts of buying and selling local food for both consumers and vendors. This finding confirmed that communication was key to FM buying and selling. Consumers at FMs ask for detailed product information from the vendors to relieve their anxiety about the food quality. Likewise, vendors at FMs maintain the feeling of remaining local with small talk. The survey findings also showed that the online habits of the two groups in buying and selling local food differed. Although the

consumer group is generally interested in online shopping, the business capacity of the sellers was an obstacle to online sales.

Fourth, the findings that emerged from the observations and surveys showed that a local food map's content should meet user needs including showing the closest local food points, reducing consumers' anxiety over food quality, presenting detailed information about the products, and showing communication opportunities. Therefore, the observation and survey findings clustered the consumer- and vendor-based requirements into three main groups: (1) geographical proximity, (2) detailed information about local food, and (3) communication between consumers and vendors (see Section 5.3 for the local food map requirements). Local food map users' needs based on the observation and survey findings were then fixed with personas (see Section 5.4 for the personas). User scenarios were developed based on the personas to help prepare visualisation workshop tasks (see Section 5.5 for the user scenarios).

Point 4 associates design practice with a visualisation workshop that synthesises the design approaches of two disciplines to investigate symbol design on digital maps. While this thesis acknowledges that it is impossible to create a single symbol standard for maps (Robinson *et al.*, 2011), it argues that symbols on digital maps should be designed by considering users' needs, and their interface languages need to be simple, straightforward, and efficient for users to interact with them easily. In this vein, information designers were involved in an online visualisation workshop to respond to local food map users' needs by drawing symbols, variables, and labels (see Chapter 6 for the visualisation workshop). *In this way, designers participating in the workshop focused on design criteria for simplifying the message for local food map users and proposed several approaches that would contribute to the symbolic language of digital maps while responding to user needs.*

The most important contribution of the visualisation workshop, which considers aesthetic and functional design principles, was that it allows for providing outcomes that users will evaluate and facilitates achieving generalisable insights in the interface design of digital maps. The following findings from the workshop on the

symbolic language of digital maps summarise the potential transferable insights:

(a) Using pictorial/mimetic symbols rather than geometric/abstract, but with different abstraction levels applied;

(b) Using labels to clarify or support the meaning or message of the symbols;

(c) Considering readability and legibility by choosing standard typefaces such as Arial and Myriad Pro;

(d) Applying a high contrast between the labels and background;

(e) Using conventional symbols for car parking and delivery options, which are connotatively stronger, instead of designing from scratch;

(f) Providing unity and harmony in designing related tasks.

The second contribution of the visualisation workshop was that it went beyond the purpose of searching for addresses on digital maps and presented an idea about designing a map interface where users can access the detailed information they need about the destination. Designers investigated how the detailed information could be adapted to a map interface without reducing the effectiveness of the geospatial information on digital maps. Findings from this investigation showed that designers suggested two representation methods for adapting daily information about local food to a digital map: (1) placing the user comments or price information directly on the base map and (2) opening an external white box layer to display all associated information within the box, independent of the base map.

Another possible contribution was that designers investigated how to show the hierarchy of different distances without a measuring tool, considering the semiotic correspondence of the symbols and graphical variables. Despite the exploratory nature of this study, the findings provided some insight into how

information about the hierarchy of distances can be displayed without a measuring tool on maps. This study has found that the variables may be used to show distances by using (1) a line symbol with an area symbol, (2) a line symbol with an area symbol and a size variable, (3) an area symbol with a colour hue value, (4) a line symbol with the size feature, and (5) the semi-transparent area symbol with a line symbol. *This framework might potentially be developed by researchers through further studies.*

Point 5 focuses on usability testing to get feedback from the target user group about the interface elements created by design practitioners. The evaluation stage is critical to producing usable products in a user-oriented way (Jordan, 2002). Stahl-Timmis (2017, 456) points out that one of the metrics to evaluate the visualisation design is to gain insight from the users looking at the design. *In this regard, a greater focus on usability testing in cartography could help designers increase usability on maps.* The usability testing developed in this thesis assisted in understanding how users interpret information and how a design process that considers design criteria could facilitate the local food map interface (see Chapter 7 for usability testing). The findings from the usability testing provide the following insights for future studies:

(a) Pictorial/mimetic symbols can be interpreted more easily than geometric/abstract symbols;

(b) A high level of abstraction of a symbol can adversely affect its comprehensibility and interpretation;

(c) Combining a pictorial symbol and a label can strengthen the meaning of the message;

(d) A label used as a symbol itself can be interpreted more efficiently rather than a pictorial/mimetic or geometric/abstract symbol;

(e) Conventional symbols that users are familiar with can be more convenient and accessible than newly designed symbols;

(f) Legibility of symbols and labels can affect user symbol choice;

(g) Use of standard typefaces can increase readability and legibility;

(h) High contrast between the text and background increases legibility and clarity.

The usability testing findings also contribute to the current literature on how to show non-spatial information on digital maps. It found that detailed product information displayed on a map within a defined area provided users access to related information as a whole rather than directly viewing pieces of information on the base map. *Therefore, multi-layered studies on maps offer a point of progress for future studies on making relevant and detailed information applicable and accessible to users.*

A significant drawback of the spatial information investigation in the usability testing is that a limited number of examples were tested. The possible findings of this limited investigation showed that (1) combining a line symbol, an area symbol, and a size variable can help determine the approximate distance without giving numerical information; (2) an area symbol with a colour value variation can give approximate information about the distance; and (3) a line symbol might likely work with a size variable to interpret the same distances.

8.2 Contribution of this thesis

From an information design standpoint, this thesis sheds light on local food map design for locals. Previous research on special-purpose maps that call for specific user groups has limited relevance either because users' needs are overlooked (van Elzakker and Ooms, 2018) or because there are no practical guidelines for creating maps and visualisations (Roth, 2013). This thesis provides the first comprehensive assessment of the needs of potential local food map users. In this vein, this thesis contributes to elucidating the existing meanings of local food by

understanding local food buyers' and sellers' needs. Additionally, this thesis reveals that for a user-friendly local food map, the target user group (consumers and vendors) should be included in the design process, and a design framework should be developed that accounts for their needs. **In this regard, the most prominent finding is that user research has promoted a user experience focus in digital map design.** Accordingly, if digital maps are designed in a way similar to online navigation systems that overlook the end user and focus only on interface design, they are very unlikely to meet users' needs. **There is, therefore, a definite need for detailed user research in map design before the design practice begins.**

The user research that has been identified also assisted in making the visualisation workshop tasks clear and straightforward and allowed the development of use cases for usability testing. **The main contribution of the visualisation workshop to cartographic studies is that it provides insights into how to develop easier-to-use maps and suggests how to identify a wide range of symbols to meet users' needs.** An additional contribution is to go beyond existing maps and explore how to design digital maps as an interface where users can find non-spatial information. **The usability testing undertaken in this thesis contributes to the current literature on the usability of digital map interfaces by providing user feedback to make them more user-friendly.**

8.3 Future research possibilities

The findings of this thesis provide several practical suggestions for future research to improve the effectiveness of local food maps. However, this current study is limited as it did not examine all the parameters that define local food regarding food quality, such as taste and freshness. Further research could apply all the findings that emerged from the user research to provide more ways to satisfy users when finding out about local food. Further, the online selling habits expressed by vendors in the survey warrant further study to consider why they are not interested in online selling even though they want to promote their sales. It is also evident from the research that communication between consumers and

vendors is one of the most critical factors influencing local food buying and selling. Studies to gain more insight into maps that allow consumers and vendors to communicate effectively with each other could be extremely valuable to designers and cartographers exploring transferring social life practices to the digital world.

Further, it would be worthwhile investigating the use of graphical variables on maps, which was a limited focus of this thesis, using semiotic features of the variables to give information about ordered data for everyday users.

With regard to the usability testing, despite having a large number of participants, no vendors participated in the evaluation stage. Thus, the usability testing could be improved to include vendors.

In order to explore digital map interfaces, further research could organise visualisation workshops that would include information designers and cartographers. The cartographers in the domain could suggest a conventional approach regarding how to handle users' needs and how to adapt them to map interfaces. The approaches from the practitioners of the two disciplines could offer an opportunity to evaluate which design criteria they considered during design practice comparatively. Then, the outcomes of this collaborative approach could be evaluated by getting user feedback through usability testing. Thus, this study could provide a complete interdisciplinary picture of symbol design on digital maps.

In summary, this thesis has demonstrated several practical implications for optimising the user experience on digital maps. The findings of the thesis suggest a framework for making local food maps user-friendly while considering functional and aesthetic design principles in the visualisation process. In doing so, this thesis contributes to cartography research and promotes the usability of digital maps.

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Appendix 1: Consumer and vendor questionnaires at FMs

- 1. A: Copy of questions for consumers
- 1. B: Copy of questions for vendors

1. A: Copy of questions for consumers

Questions for consumers

Your participation in this study is entirely voluntary. Please feel free to decline to answer any questions if you would prefer not to.

1. How often do you visit Farmers' Markets?

   Once a week ☐ ☞ (Skip to 3) Once a fortnight ☐ ☞ (Skip to 3)

   Once a month ☐ ☞ (Skip to 3) 4 or 5 times in a year ☐ Very Occasionally ☐

2. Is there any specific reason why you do not come more often?

   .....

   .....

3. Do any of the following factors have an influence on how frequently you visit?

   Accessibility of the market ☐ Car Parking ☐ Prices ☐ Quality of products ☐

   Range of products ☐ Easy Access to Other Retail Outlets ☐

4. Please tell me how important you think the following features are when visiting this farmers' market. Please leave blank those features that have no importance at all.

	Very important	Of some importance	Not important
Ease of access			
Ease of car parking			
Reasonable Prices			
The high quality of products			
Knowing more about what you are eating			
Buying local food			
Shared values between consumers and vendors			
Healthy eating/lifestyle			
Spending time with others who engage with local community			
Support local business			
Other (Please specify)			

5. Which products do you usually buy from Farmers' Markets?

.....

6. Where do you regularly shop other than Farmers' Markets?

.....

7. Why do you shop at this/these (other) places?

.....

.....

8. Where do you live?

.....

9. How do you travel to come here?

.....

10. How long did it take to get here?

.....

11. Do you shop online?

Yes ☐ Because, ...

No ☐ Because, ...☞ (Skip to 14)

12. Do you buy food online?

Yes ☐ No ☐

13. Do you buy local food online?

Yes ☐ No ☐

14. Do you use websites or social media channels to find/find out about local food?

Yes ☐ ☞ (Skip to 16) No ☐

15. Why do you not use websites or social media channels to find/find out about local food?

.....

.....

16. How did you find out first about this Farmers' Market?

Advertising ☐ Newspaper/Magazine/Radio/Television/Outdoor/Others.....

Social Media Channels: ☐ Facebook/Twitter/Instagram/Others.....

Web sites ☐ The website is: .....

Direct Mail/Newsletter ☐ From: .....

Catalogues/Leaflet ☐

Word of mouth ☐

Community ☐ The name of the community: .....

17. If there was a general online service to find out about products and where they are grown/ sold, would you be interested?

Yes ☐ Because, ...

.....

No ☐ Because, ...

.....

Thank you for participating in my research.

1. B: Copy of questions for vendors

Questions for vendors

Your participation in this study is entirely voluntary. Please feel free to decline to answer any questions if you would prefer not to.

1. How do you describe your Job?

   Farmer ☐ Grower ☐ Market Gardener ☐ Other ☐ .....

2. What are you selling at the Farmers' Markets?

   .....

   .....

3. Where is your place of production?

   .....

   .....

4. Why did you choose ---- Farmers' Market to sell your product?

   .....

   .....

5. Are you involved in other farmers' markets except this market?

   Yes ☐ Where: .....

   .....

   No ☐

6. Do you sell your products around your place of production?

   Yes ☐ Where: .....

   .....

   No ☐

7. Do you do home delivery?

   Yes ☐ No ☐

8. Do you have a website?

   Yes ☐ Web site address: .....

   No ☐ ☞ (Skip to 10)

9. Does your website efficiently represent your job/products?

Yes ☐

No ☐ Because, ...

.....

10. Do you use social media channels?

Yes ☐ Because, ...

.....

No ☐ Because, ...

.....

11. Do you sell online?

Yes ☐ No ☐ ☞ (Skip to 15)

12. Which platforms do you use for selling online?

Social Media Accounts ☐
Facebook/Twitter/Instagram/Others.....

Web sites ☐ Website Address: .....

Other organisational websites ☐ The name of the organisation: .....

Your corporate e-mail address ☐

13. Which way of selling is more profitable?

Online selling ☐ Face-to-face selling in your place of production ☐

Face-to-face selling at Farmers' Markets ☐

14. What is the advantage or disadvantage of selling online? .....

..... (Skip to 16)

15. Why do you not sell online?

.....

.....

16. If there was a general online service for people selling from farms, would you be interested?

Yes ☐ Because, ...

.....

No ☐ Because, ...

.....

17. How do you describe your customers? (multiple choice)

- Local people ☐ Nonlocal/Broad Locality ☐
- Ages 26-44 ☐ Ages 45-64 ☐ Ages 65-84 ☐ Other.....
- Satisfied with their experience in this market ☐

  Dissatisfied with their experience in this market ☐
- Farm-related People ☐ Community-related People ☐
- Close-knit Community ☐ Scattered Community ☐
- Other (Please specify) .....

18. Why do people tend to buy farm products?

.....

.....

19. What do people (customers) usually ask you? For example, what did you talk about with one of your customers this morning?

.....

.....

.....

Thank you for participating in my research.

Appendix 2: Photographs at FMs surveyed


M&S


Ginger
Fruit pots, freshly squeezed juices & smoothies
Ginger
Picnico


claire's
GAP

Appendix 3: Visualisation workshop materials

- 3. A: Copy of the guide used by participants during the workshop
- 3. B: Copy of workshop tasks
- 3. C: Copy of advertisement for workshop

3. A: Copy of the guide used by participants during the workshop

Visualisation Workshop for exploring the relationship between information design and cartography regarding an interactive local food map, Department of Typography & Graphic Communication, University of Reading Ethics approval documentation
24 June 2021

Visualisation Workshop for exploring the relationship between information design and cartography regarding an interactive local food map

The explanations of point symbols, line symbols and area symbols in this Appendix 1 are quoted from the book ***Cartography an introduction***[1]*, which will be used as reference material for the visualisation workshop.*

"Point Symbols

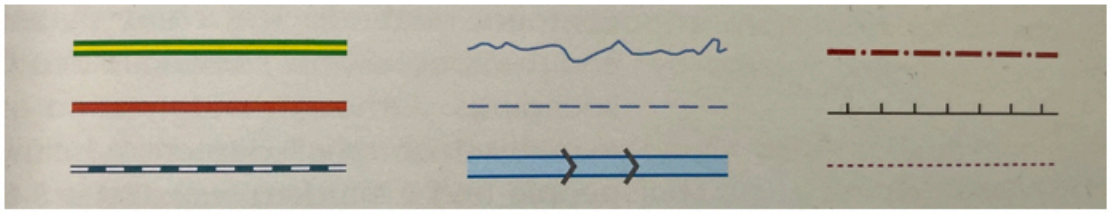
Point symbols are mostly;

- *Geometric*- based on circles, squares and triangles
- *Conventional*- like a red cross for a hospital, or
- *Mimetic*- looking like some aspect of the object they are representing, such as an aeroplane to represent an airport.

"Line Symbols

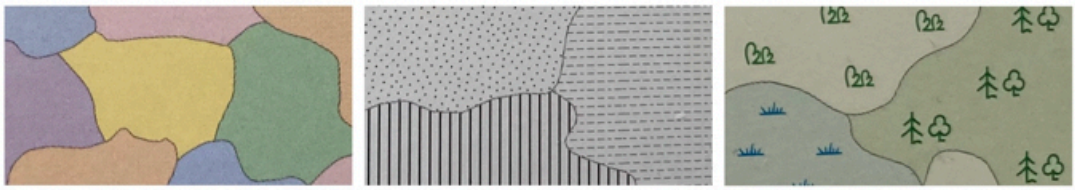
Line can be simple strokes, but most are more complex. For instance, roads are often cased with two lines enclosing a coloured fill. Many lines are varied by adding to them, such as the conventional symbol for a railway, or broken up (pecked or diced) like many boundary lines. Ticks can be added one side of the line to denote a canal, for example.

[1] Darkes, G., & Spence, M. (2017). *Cartography an Introduction* (2nd Edition). British Cartographic Society.



"Area Symbols

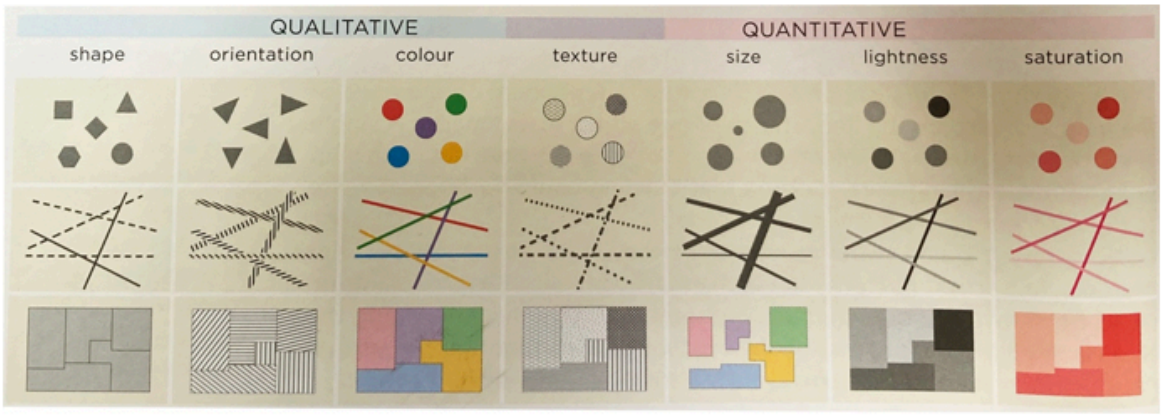
Areas form the background to a map and may be important symbols in their own rights. They are either filled with colours or with textures and patterns. On complex maps such as geology and land use, the addition of letters or symbols to the areas gives valuable visual clues to make identification much easier than a vast range of marginality different colours. Areas often have a thin bounding line or keyline.



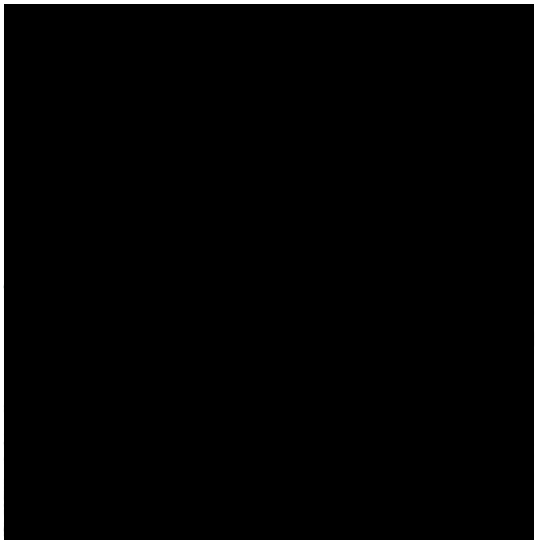
"Variables

Points, lines and areas are varied in order to communicate different types of map information. The graphic variables include;

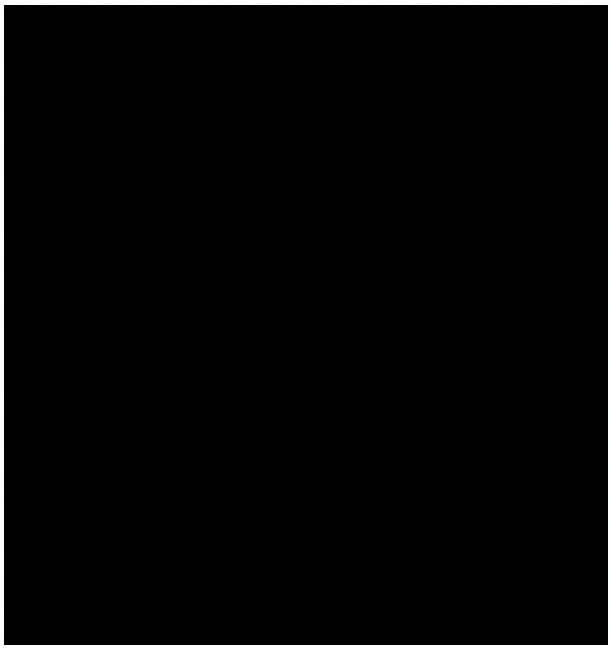
- Size
- Shape
- Colour
- Lightness
- Orientation
- Pattern or Texture



The contemporary examples of data visualisation below were taken from the relevant Instagram Accounts.[2]

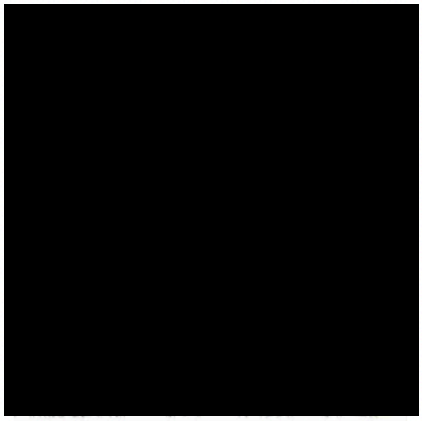


(a)



(b)

(c)



(d)

[2] Examples a and b were taken from: @urbandesign_af
Examples c and d were taken from: @act.of.mapping.

3. B: Copy of workshop tasks

Visualisation Workshop for exploring the relationship between information design and cartography regarding an interactive local food map, Department of Typography & Graphic Communication, University of Reading Ethics approval documentation
24 June 2021

Visualisation Workshop for exploring the relationship between information design and cartography regarding an interactive local food map

QUESTIONS AND TASKS

The tasks that you will carry out will be used to investigate interactive map interface solutions for mobile phones.

Task 1

Duration 60 minutes. (note: times and task wording may be updated slightly in response to the pilot study, as needed)

Task 1 is based on the consumer survey conducted in the early stage of the research.

Barbara and Tom live in Winchester, Hampshire. They want to buy some cherry tomatoes from the closest local food shop. They are looking for detailed information about the cherry tomatoes regarding the quality (taste or freshness) and particularly food miles. In order to ensure the quality of products, they want to contact the seller.

Task 1.1.: *Duration 25 minutes*

Barbara and Tom's location is shown at a certain point in the centre of the map (See Fig.1).

1. *Please show/draw one local food shop/seller around Barbara and Tom's house with a symbol in Fig 1. Please use point symbols with/without variables and text on the map (see Appendix 1).*

2. *Please duplicate the symbol you created in the item 1 on three different points. Then show the hierarchy between them depending on the proximity of Barbara and Tom's house using the size/ saturation/colour/texture variables on point/line/area symbols in Fig 1.*

3. *Please choose the closest local food point you have shown. Then show what it looks like when you have chosen. Then put two transportation symbols (point/line/area) for walking and cycling around the closest local food point in Fig 1.*

4. *Please choose the closest local food point you have shown. When you click this point (symbol), you will see that the cherry tomatoes are sold in this point/shop. To show this information, please add a point symbol with/without variables and text.*

Figure 1: The map shows Barbara and Tom's house on the border of Winchester, Hampshire

Task 1.2*: Duration 15 minutes*

Barbara and Tom are not sure of the quality of the cherry tomatoes (freshness or taste). The couple want to view the customer's comments to understand this. Then, to decide whether they want to buy, they want to see the price and quality together. Lastly, if needed, they want to contact the seller.

1. *Please show a customer's comments symbol in Fig. 1 that you have been already studying in Task 1.1 in a relevant place around the cherry tomatoes you indicated. Then, show one customer's comment somewhere on the map/screen.*
   The comment is: <u>The taste and freshness are excellent! I loved it.</u>
2. *Please put a price symbol of the tomatoes around the customer's comments to display the price and quality together. The price will be shown as <u>1.5 kilos of cherry tomatoes is £11.50.</u> You can edit the writing of the statement about tomato price to meet your design as long as the relative values, however expressed, remain the same.*
3. *Please show what the page/map needs to enable possible communication between Barbara&Tom and the seller. You can draw/put a symbol, sign or button on the map/screen.*

Please use Fig.1, which you have worked on in Task 1.1.

Task 1.3.: *Duration 20 minutes*

In Task 1.1 and Task 1.2 the participants pinned the closest local food point that sells cherry tomatoes by using the symbolisation methods.

In Task 1.3., Barbara and Tom want to see detailed information about the cherry tomatoes that are sold in one local food point, specifically the food miles (where the cherry tomatoes come from).

The cherry tomatoes that Barbara and Tom want to buy come from Fareham to Winchester as shown on the map (See Fig. 2).

1. *Please choose a, b or c. Then show your choice with an area symbol (with/without variables) to show the information about where the cherry tomatoes come from in Fig. 2.*

    a. *On the map, using line symbols with appropriate variables*
    b. *Around the map, on a blank space*
    c. *On the map with a semi-transparent layer*

2. *Then, show the higher CO emission for* ***route a*** *and the lower CO emission for* ***route b*** *below using map symbols and variables.*

    a. *Between Fareham and Eastleigh, 16.3 miles (higher CO emissions)*
    b. *Between Eastleigh and Winchester, 9 miles (lower CO emissions)*

Figure 2: The map shows where the cherry tomatoes that Barbara and Tom want to buy come from in the border of Hampshire

15 MINUTES INTERVAL

Task 2

Duration 20 minutes

Task 2 is based on the vendor survey conducted in the early stage of the research.

Rob is a vendor and farmer in Hampshire. He wants to display the other local food points that sell his products with different delivery options. This is because he is struggling with delivery times and food spoilage concerns.

His products are distributed to local shops daily, and this situation changes delivery options for customers. His farm usually works with a box scheme, but some local shops have various delivery options. For this reason, they want to show various shopping points with different delivery options for his own products on a map.

1. *Please put a symbol with/without variables on the map in Fig. 3 to show Rob's farm on the map.*

2. *Please put three symbols with/without variables on the map in Fig. 3 to show other local food points that sell Rob's farm products.*

3. *Please add a symbol to one of the local food points that you have shown in Fig. 3 to display delivery options to any local food point as shown below;*

    - *Home delivery*
    - *Click and collect*

4. *Rob's farm has a car park. Please locate it around his farm symbol that you have indicated in item 1 using appropriate symbols, variables and text.*

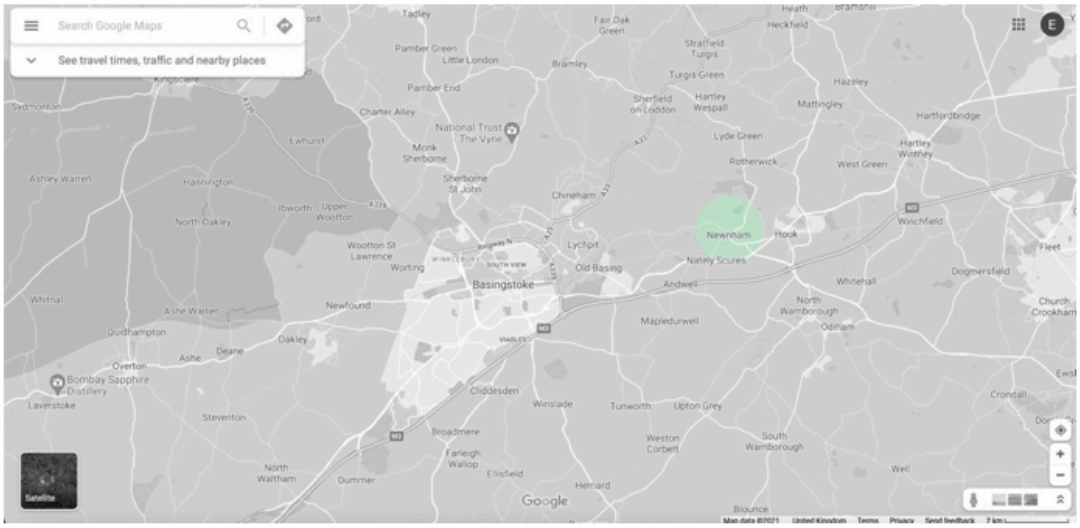


Figure 3: The map shows Rob's farm

3. C: Advertisement for workshop

Exploring Visualisation Solutions on Interactive Local Food Maps

Dear students,

I am writing to ask you to help me with my PhD research. As part of this I am convening a workshop to exploring appropriate visualisation solutions for an interactive local food map.

It would be very helpful if you could attend this workshop. I will ask you to undertake some prepared tasks based on user scenarios drawn from my prior research. The tasks will involve designing elements of the interface using Adobe Illustrator.

I will provide three base map images that show my research area in A1 document form. I will share a OneDrive folder containing these in advance. At the workshop I will explain more about the project and what I would like you to do.

The 2-hour workshop will take place ***via Teams in the last two weeks of July***.

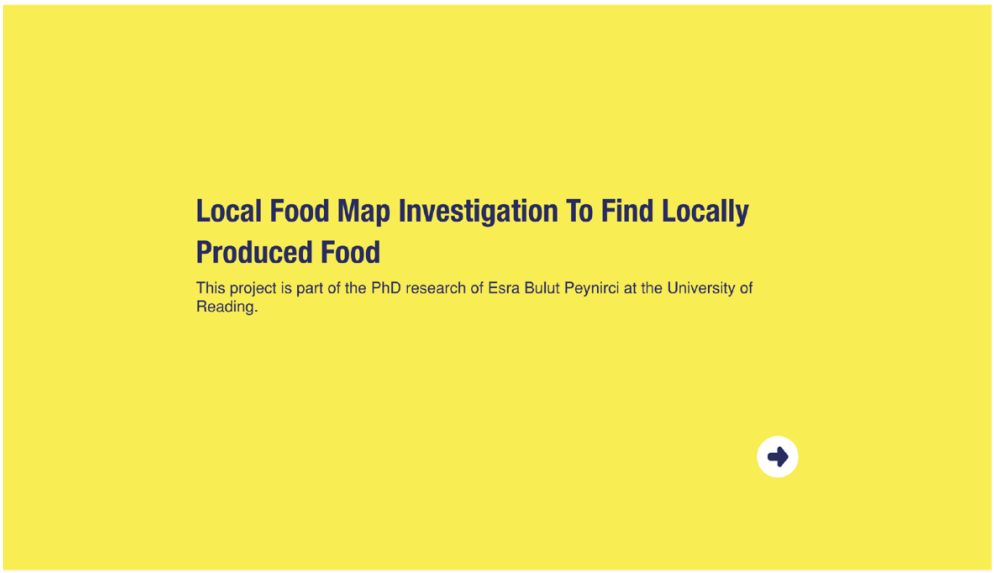
I hope you will consider joining the workshop. Please feel free to contact me if you need any further information.

In this workshop, you will be expected to **participate actively** in ***a 2-hour session***.

To participate, please get in touch with me by 15 July.

Esra BULUT PEYNIRCI
E-mail: e.bulutpeynirci@pgr.reading.ac.uk
Phone Number: [redacted]

Appendix 4: Consent form and usability testing screenshots



Participant information

Local food map investigation to find locally produced food

This project is part of the PhD Typography and Graphic Communication dissertation research undertaken by Esra Bulut Peynirci in the Department of Typography & Graphic Communication at the University of Reading. It has been supervised by Prof Sue Walker and Dr Matthew Lickiss.

The project aims to gather locals' insights/choices to explore the best ways to present the information that locals will find out about local food on interactive maps. The findings of the study will contribute to a contextual understanding of the necessities of local food maps' interfaces at the focus of Esra Bulut Peynirci's research.

Your task

Participation is voluntary and there is no remuneration for taking part. You have to be 18 years or older to participate.

You are asked to answer an anonymous set of online questions about finding out about the local food maps design.

If you agree to take part, then a set of map-based questions will be presented to you. During the process, you will try to complete typical online map activities. You will be asked one question on each page. Then you will choose a button under the map to answer the questions.

The application takes about 10 minutes to complete. None of these questions are compulsory.

Data and records

All responses are anonymous and you are not required to provide any personal contact information. The findings of the study will be used in the writing of Esra Bulut Peynirci's dissertation.

The test is being hosted on http://www.robucode.co.uk/phd/research and will be live for 6 weeks. Thereafter the responses (anonymous) will be transferred to a password-protected University server for the duration of Esra Bulut Peynirci's studies and deleted from the original test host. The survey host tool will not store the data collected or collect other data.

The Department of Typography & Graphic Communication will keep a separate record of the total number of participants in this study.

Statement of consent

This project has been reviewed by the University of Reading Research Ethics Committee and has been given a favourable ethical opinion for conduct.

By ticking the consent box below and submitting the form, you are confirming that you have read and agree to the arrangements described here in so far as they relate to your participation.

If you have any questions, please contact Esra Bulut Peynirci, (e.bulutpeynirci@pgr.reading.ac.uk) or Matthew Lickiss, (m.lickiss@reading.ac.uk) or the Department (typography@reading.ac.uk).

Thank you for taking part in Esra Bulut Peynirci's research.

☑ I have read the above and consent

Submit

When at a farmers market, I am normally a: Consumer Vendor

My age is between: 18-25 26-44 45-64 65-84

Local Food Map Investigation To Find Locally Produced Food

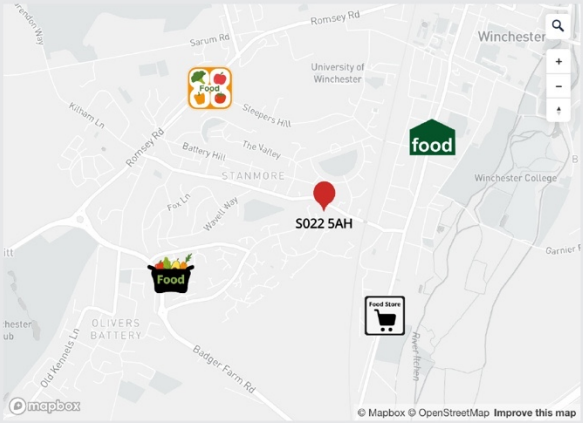
Barbara and Tom are a retired couple who live in Winchester. They will have some guests at the weekend, but no cherry tomatoes are left in the fridge. They want to check the detailed information about cherry tomatoes before buying, such as finding out where they come from and others' comments.

In short, they need your help.

Let's begin!

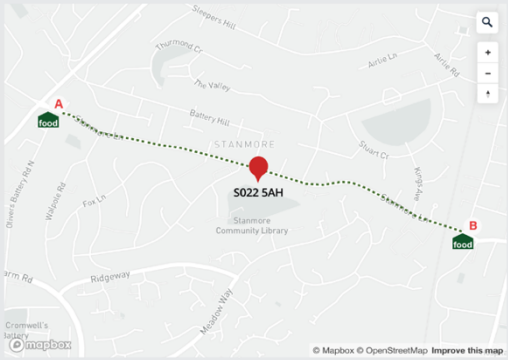
Barbara and Tom's house has been pinned with the postcode SO22 4AH on the map. They can see four food sellers around their house, but Barbara is confused about which seller sells local food.

1. What symbol do you find most appropriate to show a local food shop?
   Please click the button of your choice below.



Barbara and Tom's house has been pinned with the postcode SO22 4AH on the map. They want to go to the closest food shop, but they cannot decide which shop is the closest between A, B or C.

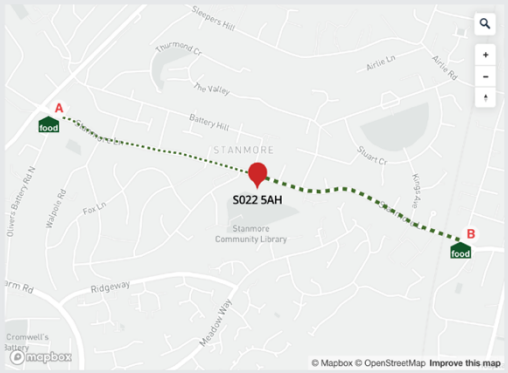
2. Which local food shop is the closest to Barbara and Tom's house?
Please click the button of your choice below.



- Shop A is closer to Barbara and Tom's house than shop B
- Shop B is closer to Barbara and Tom's house than shop A
- Shop A and B are equal distance to Barbara and Tom's house

Barbara and Tom's house has been pinned with the postcode SO22 4AH on the map. They want to go to the closest food shop, but they cannot decide which shop is the closest between A, B or C.

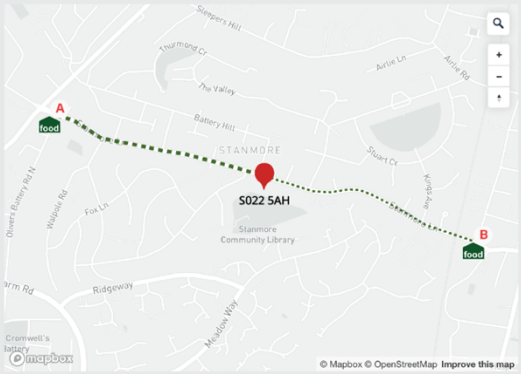
2. Which local food shop is the closest to Barbara and Tom's house?
Please click the button of your choice below.



- Shop A is closer to Barbara and Tom's house than shop B
- Shop B is closer to Barbara and Tom's house than shop A
- Shop A and B are equal distance to Barbara and Tom's house

Barbara and Tom's house has been pinned with the postcode SO22 4AH on the map. They want to go to the closest food shop, but they cannot decide which shop is the closest between A, B or C.

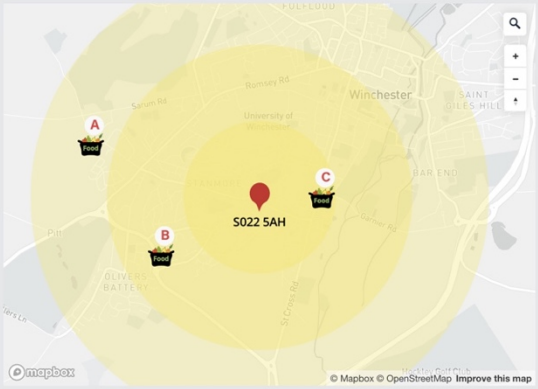
2. Which local food shop is the closest to Barbara and Tom's house?
Please click the button of your choice below.



- Shop A is closer to Barbara and Tom's house than shop B
- Shop B is closer to Barbara and Tom's house than shop A
- Shop A and B are equal distance to Barbara and Tom's house

Barbara and Tom's house has been pinned with the postcode SO22 4AH on the map. They want to go to the closest food shop, but they cannot decide which shop is the closest between A, B or C.

2. Which local food shop is the closest to Barbara and Tom's house?
Please click the button of your choice below.



A B C

A, B and C indicate tomato sellers, but Tom cannot decide which one sells cherry tomatoes.

3. Which food seller do you think is more likely to sell cherry tomatoes?
Please click the button of your choice below.

A B C

The cherry tomatoes come from Fareham to Winchester, stopping by Eastleigh on the map shown.

4. How would you describe the distance between Eastleigh and Winchester?
Click the button of your choice below.

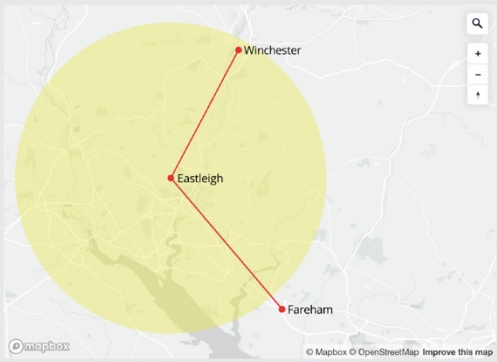
The distance from Fareham to Eastleigh and Eastleigh to Winchester are equal

The distance from Fareham to Eastleigh is greater than Eastleigh to Winchester

The distance from Fareham to Eastleigh is less than Eastleigh to Winchester

The cherry tomatoes come from Fareham to Winchester, stopping by Eastleigh on the map shown.

4. How would you describe the distance between Eastleigh and Winchester? Click the button of your choice below.



- ○ The distance from Fareham to Eastleigh and Eastleigh to Winchester are equal
- ○ The distance from Fareham to Eastleigh is greater than Eastleigh to Winchester
- ○ The distance from Fareham to Eastleigh is less than Eastleigh to Winchester

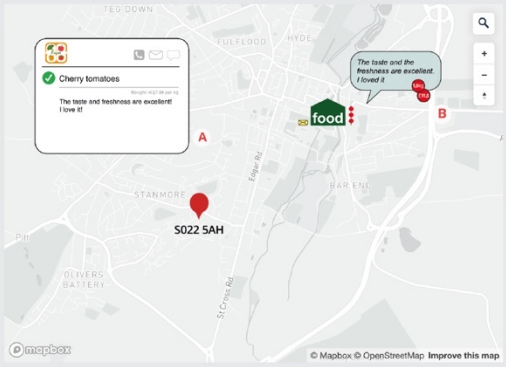
The cherry tomatoes come from Fareham to Winchester, stopping by Eastleigh on the map shown.

4. How would you describe the distance between Eastleigh and Winchester? Click the button of your choice below.

- ◉ The distance from Fareham to Eastleigh and Eastleigh to Winchester are equal
- ○ The distance from Fareham to Eastleigh is greater than Eastleigh to Winchester
- ○ The distance from Fareham to Eastleigh is less than Eastleigh to Winchester

Three local food sellers below give information about what they sell, their customers' opinion about their products, prices and contact the seller options.

5. If you were looking for others' comments, products' prices and contact the seller options, which sellers' display way would be convenient for you?



A B

Local Food Map Investigation To Find Locally Produced Food

Rob identifies himself as both a farmer and a vendor. His farm and farm shop are located in Hampshire. He needs a map-based website. Some of his consumers are not happy with not finding the selling points of Rob's products, but his farm products are distributed to some local shops. This situation affects delivery options as well. For this reason, he needs to show various shopping points and different delivery options for his products on a map-based website.

In short, they need your help.

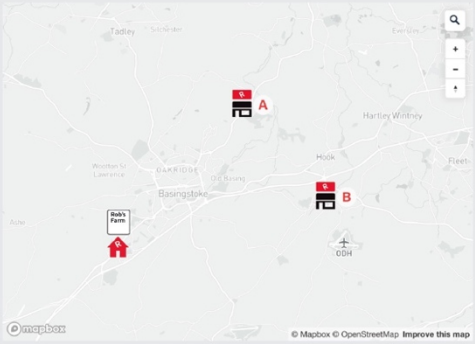
Let's begin!

There are four local food sellers symbols on the map below.

1. If you were Rob, what symbol would you choose to show your farm on the map?
   Click the button of your choice/choices below.

The left symbol on the map below indicates Rob's farm.

2. What do you expect to see in the A and B locations shown on the map?
   Click the button of your choice below.



- Rob's office
- Rob's other small shops
- Petrol stations around Rob's farm
- Other shops that sell Rob's products

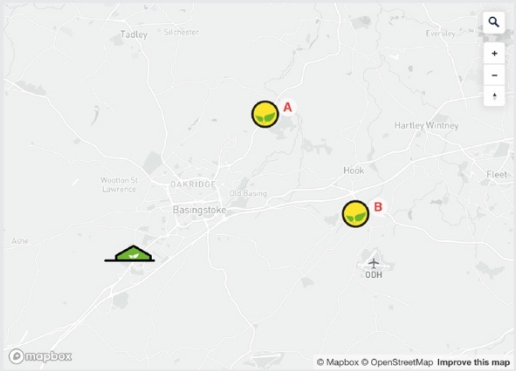
The left symbol on the map below indicates Rob's farm.

2. What do you expect to see in the A and B locations shown on the map?
Click the button of your choice below.

Rob's other small shops | Harvest points of Rob's farm | Other shops that sell Rob's products | Food Banks that have Rob's products

The left symbol on the map below indicates Rob's farm.

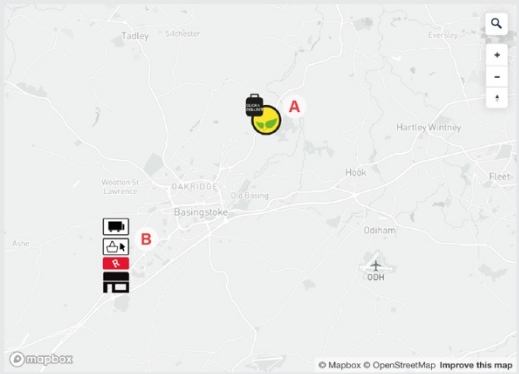
2. What do you expect to see in the A and B locations shown on the map?
Click the button of your choice below.



Harvest points of Rob's farm | Other shops that sell Rob's products | Rob's other small shops | Healthy-Eating restaurants that buy from Rob's products

Two food sellers shown present some delivery options to their customers.

3. Can you choose the sellers that have both home delivery and click and collect options?
Click the button of your choice below.



A | B | Both | None

Appendix 5: Consent forms

- 5. A: Copy of consent form for consumer survey
- 5. B: Copy of consent form for vendor survey
- 5. C: Copy of consent form for contact information to participate in future studies
- 5. D: Copy of consent form for visualisation workshop

5. A: Copy of consent form for consumer survey

University of Reading

Department of Typography & Graphic Communication

2 Earley Gate
Whiteknights, PO Box 239
Reading RG6 6AU

phone
fax
email typography@reading.ac.uk

Information Sheet and Consent Form
Survey of consumers in Farmers' Markets

Aim

This survey aims to gather your views on how you buy foods at Farmers' Markets. Your responses will be helpful in the design of a new online map-based system to help consumers find out what is available in their locality. The project is part of the PhD research of Esra Bulut Peynirci at the University of Reading.

Researchers

Esra Bulut Peynirci has devised the research and will also conduct the survey. She is working under the supervision of Professor Alison Black and Dr Matthew Lickiss.

Your Task

The survey will take about 10 minutes.

Esra will read the questions and indicate your responses on rating scales and boxes, or write your answers in the blanks.

There is no payment for participation.

If at any point you feel you do not wish to continue with the survey you will be able to stop without needing to give reasons. You can also decline to answer individual questions if you would prefer not to answer them.

If you are willing to take part, we will ask you to sign a consent form, and will give you a copy of the consent form and this information sheet.

Confidentiality

Purely for University records, you must supply your name and address and sign the consent form below. This information will be stored securely by the Department of Typography & Graphic Communication for five years. All responses are anonymous and your name and contact details do not form part of the data.

Ethical review

This application has been reviewed by the University Research Ethics Committee and has been given a favourable ethical opinion for conduct.

Consent

Survey of consumers in Farmers' Markets

I have read and had explained to me the information on this project.

I have had explained to me the purposes of the project and what will be required of me, and any questions I had were answered to my satisfaction. I agree to the arrangements described above in so far as they relate to my participation.

I understand that participation is entirely voluntary and that I have the right to withdraw from the project at any time.

Name: .....

Signed: .....

Date: .....

Address: .....

.....

.....

Contact details for investigator: Alison BLACK, a.black@reading.ac.uk
Esra BULUT PEYNIRCI, e.bulutpeynirci@pgr.reading.ac.uk

5. B: Copy of consent form for vendor survey

University of Reading

Department of Typography & Graphic Communication

2 Earley Gate
Whiteknights, PO Box 239
Reading RG6 6AU

phone
fax
email typography@reading.ac.uk

Information Sheet and Consent Form
Survey of vendors in Farmers' Markets

Aim

This survey aims to gather your views on how you sell foods at Farmers' Markets. Your responses will be helpful in the design of a new online map-based system to help producers make consumers aware of what is available in their locality. This project is part of the PhD research of Esra Bulut Peynirci at the University of Reading.

Researchers

Esra Bulut Peynirci has devised the research and will also conduct the survey. She is working under the supervision of Professor Alison Black and Dr Matthew Lickiss.

Your Task

The survey will take about 10 minutes.

Esra will read out a sequence of questions and write down your responses.

If at any point you feel you do not wish to continue with the survey you will be able to stop without needing to give reasons. You can also decline to answer individual questions if you would prefer not to answer them.

There is no payment for participation.

If you are willing to take part, we will ask you to sign a consent form, and will give you a copy of the consent form and this information sheet.

Confidentiality

Purely for University records, you must supply your name and address and sign the consent form below. This information will be stored securely by the Department of Typography & Graphic Communication for five years. All responses are anonymous and your name and contact details do not form part of the data.

Ethical review

This application has been reviewed by the University Research Ethics Committee and has been given a favourable ethical opinion for conduct.

Consent

Survey of vendors in Farmers' Markets

I have read and had explained to me the information on this project.

I have had explained to me the purposes of the project and what will be required of me, and any questions I had were answered to my satisfaction. I agree to the arrangements described above in so far as they relate to my participation.

I understand that participation is entirely voluntary and that I have the right to withdraw from the project at any time.

Name: ……

Signed: ……

Date: ……

Address: ……

……

……

Contact details for investigator: Alison BLACK, a.black@reading.ac.uk
Esra BULUT PEYNIRCI, e.bulutpeynirci@pgr.reading.ac.uk

5. C: Copy of consent form for contact information to participate in future studies

University of Reading

Department of Typography & Graphic Communication

2 Earley Gate
Whiteknights, PO Box 239
Reading RG6 6AU

phone
fax
email typography@reading.ac.uk

Contact information to participate in future studies

Please provide your preferred contact details if you would like to be involved in the further steps in Esra Bulut Peynirci's research to design a map-based system to connect producers of local farm products with consumers.

In future research Esra might, for example, ask for your opinion about the future design of the system she is producing. She might ask you to try out prototypes or take part in interviews about the system. You can decline to take part in any of these further stages if you prefer. And she will let you know when the final stages of the project are complete so that you can see how her work developed.

If you are willing for Esra to contact you in the future, please sign this form and include your preferred contact details. This form will be stored securely in paper form by securely by the Department of Typography & Graphic Communication for the duration of Esra's PhD studies. You will not be contacted by any one other than Esra.

Consent

I have read and had explained to me the information on this project.

I have agreed to have my data stored for purposes of being invited to participate in the future stages of this project.

I understand they would be stored securely in the Typography and Graphic Communication at University of Reading.

I understand if I wish to have my details removed, I can request this.

I have a copy of this information sheet with contact details for Esra Bulut Peynirci.

Name:

……

Signed: ……

Date: ……

I am a consumer/vendor/other (please specify)

……

Age: 26-44 ☐ 45-64 ☐ 65-84 ☐

Other……

Preferred contact (email/telephone/address):

Email ☐ Telephone ☐ Other ☐

Email

……

Telephone

……

……

Contact details for investigator: Alison BLACK, a.black@reading.ac.uk
Esra BULUT PEYNIRCI, e.bulutpeynirci@pgr.reading.ac.uk

5. D: Copy of consent form for visualisation workshop

University of Reading

Department of Typography & Graphic Communication

2 Earley Gate
Whiteknights, PO Box 239
Reading RG6 6AU

phone
fax
email typography@reading.ac.uk

Information Sheet and Consent Form

Visualisation Workshop for exploring the relationship between information design and cartography regarding an interactive local food map

Researchers

This workshop is part of the PhD research of Esra Bulut Peynirci. Professor Sue Walker and Dr Matthew Lickiss supervised the project, which was devised by Esra Bulut Peynirci. Esra Bulut Peynirci will also conduct the workshop.

Aim

This online workshop aims to explore the use of symbols, variables and texts to obtain local food on interactive map interfaces in a user-oriented way. Your works will be helpful in developing prototype samples to be tested in the usability testing process in the next stage of the researcher's thesis.

Participants and arrangements

You have been invited as PGR or MA students in the Department of Typography and Graphic Communication. The workshop will be carried out using Teams with Esra Bulut Peynirci. You are invited to take part as a volunteer and design a set of interface elements on base maps. None of these questions are compulsory.

You will be asked to open a shared OneDrive folder and download the consent form to participate in this workshop. Then, you will be asked to fill in the consent form and upload it to the folder created with your name in the OneDrive folder.

Next, you will be asked to download three base map images from the main folder, and you will be to respond to map design tasks on the base map images in Adobe Illustrator in response to scenarios drawn from prior research and cartographic variables. You may be asked to share your screen or send in screenshots/files of your responses during the workshop to aid discussion. Finally, you will be asked to submit your final .ai files originals to the folder created for you in the OneDrive folder when each task completed.

Confidentiality

The interface elements you design and the discovery process will be used in Esra Bulut Peynirci's thesis anonymously. If you would like to see a draft of the summary that will be included in the thesis, please let Esra Bulut Peynirci know.

The workshop will be recorded and information relevant to the study may be noted or transcribed after the event, each participant will be able to request a copy of any such notes or transcriptions that will be used in the research. Any quotes/transcriptions will be anonymised.

All data will be stored on the secure storage space provided by the University of Reading. The data will be stored on the secure password-protected storage space provided by the Department of Typography & Graphic Communication.

Purely for University records, the name and address of the participants filled in on the Consent Form will be retained by the Department of Typography & Graphic Communication for up to five years.

Ethical review

This application has been reviewed by the University Research Ethics Committee and has been given a favourable ethical opinion for conduct.

Consent

Please use tick box after each statement to confirm it has been read and agreed to.

1. I have read and had explained to me by **Esra Bulut Peynirci** the accompanying Information Sheet relating to the project on: ***Visualisation Workshop for exploring the relationship between information design and cartography regarding an interactive local food map*** ☐
2. I have had explained to me the purposes of the project and what will be required of me, and any questions I have had have been answered to my satisfaction. I agree to the arrangements described in the Information Sheet in so far as they relate to my participation. ☐
3. I have had explained to me what information will be collected about me, what it will be used for, who it may be shared with, how it will be kept safe, and my rights in relation to my data. ☐
4. I understand that participation is entirely voluntary and that I have the right to withdraw from the project any time, and that this will be without detriment. ☐
5. I understand how the data collected from me in this study will be preserved, subject to safeguards and made available in the dissertation and any related publications. ☐

6. I have received a copy of this Consent Form and of the accompanying Information Sheet. ☐

Name:

Signed:

Date:

Address:

If you have any questions, please use the Department contact details as above; or e-mail: e.bulutpeynirci@pgr.reading.ac.uk (student) or s.f.walker@reading.ac.uk m.lickiss@reading.ac.uk (supervisors).